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*Illustrated.

The Engineering and Mining Journal

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The Butte Report

The vein system at Butte, Mont., is one of the most complex, if not the most complex, of occurrences of ore deposits in North America. The jumbling of its sections of veins by intersecting faults is kaleidoscopic and the genesis of their ores is not yet a matter of definite knowledge. These conditions led the Anaconda Copper Co. to inaugurate and maintain a geological study that probably is more complete than any other mining company has ever done in its own behalf. The necessity for this was recognized by Mr. Brunton, when he was at the head of the company, and now we think it is recognized by the company that it could not mine successfully without it.

Possessing this organization and knowledge, we conceive that it was a matter of indifference to the Anaconda company whether the report of the U. S. Geological Survey came out five years late, or 10 years, or not at all. However, there are other mining interests at Butte, untested possibilities, and moreover this is our greatest copper-mining district, still in the halcyon days of its productiveness, about which the scientific world is desirous of having accurate knowledge.

In reviewing (at our request) the recently issued report of the Geological Survey, elsewhere in this issue, Mr. Sales, as the head of the geological department of the Anaconda, speaks with singular authority. It will be noted that he is decidedly adverse to the value of this report, and the force of his criticisms is enhanced by their temperateness. His conclusions are the more to be regretted, because Doctor Weed is a geologist of note and was capable of a better study than evidently he gave to his subject. He left the Geological Survey before his work at Butte was completed and apparently then lost interest in it, or never found the time to give to it that he ought to have done.

We hope that this will be the last of the long-belated reports of the Geological Survey. We have no doubt that its executive officers deplore certain recent delays just as much as we do, and the mining industry in general. We suggest to the director that hereafter he make it a stipulation in engaging members of his staff that they may not honorably leave the survey until they have completed pending work.

Needs of the Institute

The recent controversies in the American Institute of Mining Engineers have had the beneficent result of arousing interest in it, if nothing else. Any organization that is worth fighting about is manifestly worth while. Nobody fights over a dead horse. We think, however, that in the recent discussions of the affairs of the Institute the prime question has not been brought to the front. We consider this to be its conversion into an active factor in the professional lives of its members.

The Institute had become but little more than an incorporated subscription list. Membership in it was of no professional value or meaning. Even as a publishing agent it was of only moderate interest, it having been displaced in this respect to a large extent by the engineering press. Hence there had developed a feeling of dissatisfaction among the members, which was tersely expressed by the remark: "Membership being of no particular value, why should we pay $10 in dues for a $3 volume?" When it was proposed last January to require members to pay $15 instead of $10, objections were raised that crystallized into an insurgent movement which obtained a big following. Eventually the proposed increase in dues was withdrawn, but the insurgent leaders failed to recognize the desires of the members supporting them and missed an opportunity to propose and consummate a constructive, rejuvenating

program. However, such will no doubt be developed in another way.

We consider the great need of the Institute to be plans to increase its usefulness to its members. Accomplishing that, its membership will so increase that there will be no necessity for raising its dues. Its usefulness will be increased by making it a more active agent in professional and industrial matters. The mere publishing of papers will not do that. Any member will better appropriate his dues to subscriptions to two good engineering papers that he does not already take, for he will thus get more value for his money. In publishing, the Institute ought to aim for papers that the press cannot so readily secure. We mean that under the direction of committees or delegates it ought to draw out contributions and discussions that would develop the best technical practice and systematically illuminate uncertain points. Committees ought to be appointed to lead the way in the study of certain problems. Consideration should be given to economic, social and political questions affecting the mining industry. Of course, we know that such things have heretofore been touched upon in the transactions of the Institute, but they have not been in any organized, systematic way. In short, by directing its attention too narrowly to publishing, the Institute has failed to maintain professional and industrial leadership. Let it resume the exercise of that function and there will be enough of interest among its members.

We think that it may also well pursue the plan of sectional meetings that has already been inaugurated and the further plan of linking with itself the minor societies. Thus if the members of the Institute were enabled to obtain all of the papers of the Lake Superior Mining Institute, the Colorado Scientific Society and others, and *vice versa* as to the members of those societies, there would be a material gain. The organization of sectional meetings must, however, be carefully studied and controlled in order that they may not impose undue financial burdens upon some groups of members.

There is also the question of professional *esprit de corps,* the establishment of a professional society in which membership of itself has a meaning. This has heretofore been deprecated in the Institute on the ground that its purpose was purely educational, that any restriction would be snobbishness, or something like that. Yet that idea was certainly wrong. There is nothing more snobbish in engineers seeking to maintain high professional ideals than there is in the medical profession. No one can rightly consider the American Society of Civil Engineers to be an undemocratic organization, yet we see there a body of men who scrutinize their membership and are proud of it.

We may as well call a spade a spade and say that membership in the American Institute of Mining Engineers is meaningless and in spite of any recent raising of the standard no real reform can be effected inside of 20 years, because no existing member can be deprived of his membership. It has been proposed to get around that by creating a class of "fellows," who will be the members of superior professional standing, but that will be rather ridiculous and probably will excite friction.

Anyway, it was the shortcomings of the Institute in the matter of membership, failure to promote professional intercourse, and failure to attend to public functions that led to the organization by some of its members of the Mining and Metallurgical Society about four years ago. This society has thriven, has been in good financial condition, and has been an organization of unflagging interest among its members. From time to time there have been projects to amalgamate it with the Institute, but these have come to naught because the Society has insisted on the preservation of its organization. Granting that, we have but little doubt that a union could be effected, which certainly would produce professional unanimity of interest in society matters. However, we do not think that the Mining and Metallurgical Society would be likely to join the Institute under the enabling amendment to the constitution of the latter proposed at the meeting on Oct. 7.

In previous articles we have spoken of the need in the Institute for reorganizing itself under a sensible system of government and putting the latter into the control of its membership, abolishing official slates, etc. Undoubtedly there ought to be the introduction of a letter-ballot system, and probably there ought to be an abolition of proxy-voting, which has grave dangers as must have been apparent recently to thoughtful members.

Copper Production and Consumption

The statistics for the first nine months of this year, taken by quarters and as a whole, enable us to form an opinion respecting production and consumption that is not confused by erratic figures in monthly reports.

The deliveries by American refiners, by quarters, have been as follows:

	Domestic	Foreign
I.....	186,059,735	202,095,516
II.....	208,362,352	184,187,971
III.....	213,277,609	190,871,277
	607,699,696	577,154,764

The production of refiners and smelters has been as follows:

	Refiners	Smelters (a)
I.....	361,068,163	403,220,779
II.....	374,517,720	402,644,330
III.....	422,879,469	421,324,841
	1,158,465,352	1,227,189,950

(a) Partly estimated.

The smelters' figures should be reduced by about 7,500,000 lb. for the nine months to allow for smelters who report blister copper rather than the copper content thereof, and also for the copper that goes into bluestone, recovered as a by-product.

The figures presented above show that there has been but little increase in the basic production of copper during 1912; none at all until the third quarter. The refiners marched behind the smelters for six months, then began to get ahead.

The domestic deliveries during nine months averaged about 67,500,000 lb. per month; the foreign about 64,000,000; a total of about 131,500,000. Domestic deliveries increased quarter by quarter; the foreign did not. Apparently Europe early in the year reached the point of its maximum demand upon us, for the present. In the last quarter American deliveries were about 71,000,000 lb., foreign 64,000,000, total 135,000,000.

The present requirement of Europe and America from American refiners is probably between 132 and 135 million pounds per month. The present supplies to American refiners are about 139-140 million pounds per month.

The openhearth steel furnaces at the new Saucon plant of the Bethlehem Steel Co. are to use coke-oven gas for fuel. This economy has been practiced at several works in Germany, but its first application in this country will be at Saucon. Any step toward reducing the great waste of coke-oven gases which now goes on in this country should be commended.

By The Way

Apropos of the recently inaugurated enterprise of Thomas F. Cole, east of the Butte & Superior, at Butte, Mont., John D. Ryan has stated openly to his friends that he has no participation in this undertaking.

Dr. L. D. Ricketts, in behalf of the mining companies that he represents, last week bought of H. W. Hardinge the patent rights to the Hardinge conical mill in the State of Arizona for $100,000 in cash and other considerations.

They do things queerly in England. The directors of the Rio Tinto Co., Ltd., issue a circular to the stockholders telling what has been done in the preceding half-year, and head the circular "To the proprietors." Whoever thought that a stockholder anywhere had rights that a civilized director was bound to respect?

The Ingersoll-Rand Co. is shortly going to bring out a new drill, to be called "The Bull Moose," which strikes us as being a very good name for a hard-slugging rock drill. While we are on this subject of nomenclature, it will be interesting to note that the Mexican miners call the jack-hammer drill the *chicharra*, the cricket. The operator is coming to be known as the *chicharrero*.

Recent advices from Tokyo state that considerable sales of pig iron from India have been made in Japan. This iron takes the place of British pig on account of its lower price; it also replaces Chinese iron, the deliveries of which have been interrupted by the troubles in that country. The Mitsui company has been a large buyer of Indian pig, both for its own use and for the government foundry at Wakamatsu.

Winston Churchill, in a recent political speech, made some references to the friendship between Mr. Taft and John Hays Hammond, the connection of the latter with the Guggenheim Exploration Co., and of the Guggenheims with Alaska. This led Mr. Hammond to write a letter to Mr. Churchill, declaring that he has not been connected with the Guggenheim Exploration Co. since 1907. Moreover, the Guggenheims, he states, never had anything to do with the Alaska coal deposits.

We note in the last report of the Kerr Lake Mining Co. that, "It was thought wise, in order to conserve the resources of the company, to reduce production." Those amateur economists who have argued that the sooner a mine can be worked out the better for the shareholders are all wrong; that is evident. Or have the directors discovered how to make 1 oz. grow into two? And if so, what is the recipe? Or have the directors been given the foresight to see that the present high prices of silver are just the foothills of the elevations to come?

A mineral company with $3,000,000 capital is about to be incorporated, whereof the promoter telegraphs as follows: "Company owns 15 acres of minerals, such as lead, silver, amalgam, bluestone; above minerals nearly pure; also potash running 12 to 33%; phosphoric acid, 32.70%; three different kinds of marble and other valuable minerals; lead deposit covers 200 acres and averages 20 ft. thick." Pretty good, especially the 200 acres of lead on 15 acres owned.

Judge Mayer, in the Criminal Branch of the Federal District Court, Oct. 10 refused to postpone the trial of Julian Hawthorne, set for Nov. 4 next before Judge Hough. Hawthorne and his co-defendants are charged with using the mails to defraud investors in the stock of the Hawthorne mining enterprises in Canada. The adjournment was asked in the interest of Josiah Quincy. He said that Dr. Robert Bell, at one time head of the Geological Survey in Canada, an important witness for the defense, was at present in France and would not return until December.

Much was said a year or two since about the anemic condition of mining in Colorado, and the idea has been prevalent that business was not so good in that section of the county as in some others. As evidence, however, of the prosperity in the West, one of the oldest machinery houses in Denver, the Hendrie & Bolthoff Manufacturing & Supply Co., has announced to its employees that a straight increase of 10% in salaries will be made next month. It is manifest that a flat increase of this sort would not be made in times of slack business, and as this company enjoys a trade throughout practically the entire West, it may be taken as an indication that "good times" have really arrived.

Beginning with October, the well known German technical journal, *Metallurgie*, will be divided into two independent journals. The one, *Metall und Erz*, will deal with mining, concentration and metallurgy of ores, except those of iron, and will be edited by the new Gesellschaft Deutscher Metallhütten-und Bergleute. The other journal will be known as *Ferrum*, and will treat of the metallurgy of iron and steel, mechanical testing, metallography of metals and alloys, etc. This journal will be edited by Dr. Wüst, of the Königlichen Technischen Hochschule, of Aachen. While *Metallurgie* has won a well deserved place in technical literature, the two new journals will doubtless be of more direct value to their readers in the specialized fields.

A competitive examination is to be held by the U. S. Civil Service Commission in various principal cities for a mineral technologist for the U. S. Bureau of Mines, Field Service, Denver, Colo., at a salary of $3000 per annum. Applications (Form 765) must be filed with the commission by Nov. 8. The duties of the position will include a study of the occurrence, mining and separation of the rare minerals or materials containing the rarer metal and earths. There is also to be filled, by civil-service examination, the position of mine sanitary engineer for the Bureau of Mines, Field Service, the salary for which ranges from $1800 to $2400 per annum. The duties of this position will be to study the sanitary and water-supply conditions in mines and mining towns, with a view to their improvement as affecting the welfare of the miners.

A mining-machinery salesman recently walked over to a city rock pit where rock for making roads was excavated and crushed. He gave the superintendent a cigar and began talking rock drills. The drills in use there were manufactured by the company he represented, but were apparently of extremely antique pattern. The young salesman with characteristic enthusiasm and fresh from talking with mine superintendents, began to tell the city official of a very efficient one-man drill that was making records for itself. He claimed that if the city would install the improved type, at least one-half the present force of men could be dispensed with. At this point the city official spoke up; "Young man," he said, "if you can give us a drill that will require more men to operate and make more jobs that aren't too hard, we'll be interested, but this new machine's not in our line." The salesman retreated. It was too close to election time.

A story of how six American women remained in a mine tunnel for 2½ days during the attack by Mexican rebels on the mining camp of El Tigre, in Sonora, was contained in Los Angeles dispatches, quoting J. W. Malcomson, consulting engineer of the El Tigre Mining Co. When the surrender of the camp, demanded by the rebel general Salazar, was refused, the wives of the company officials were placed in the tunnel with provisions to last several days. They were accompanied by a guard of Americans, who had 30 rifles and 5000 rounds of ammunition. When Salazar entered the camp, after a 30-hr. bombardment, he told the Americans he knew rifles and ammunition were secreted in the tunnel, and demanded them. Five rifles and 500 rounds of ammunition were brought out, and the rebel general was not curious to learn if more were concealed. After the rebels evacuated upon the approach of Federal reinforcements, the women returned to daylight, none the worse for their experience. Recent dispatches tell of the approach of a rebel band proposing to attack El Cro. They were met at Palizada by a volunteer band of Englishmen and Americans and departed after a few volleys.

Heinze - Barnes - King Litigation

A verdict has just been given the Assets Collecting Co., assignee of the claim of Arthur P. Heinze, against the Barnes-King Development Co., for $75,000, and the moneys of the Development company attached to secure payment. The facts appear to be as follows: The Barnes-King Mining Co. was chartered in Delaware in 1906, with a capital stock of 12,000 shares. Mr. Campbell, attorney for the Marcus Daly estate, and Mr. Lalor, secretary of it, obtained an option on all of this stock, which was deposited in the First National Bank of Great Falls. Campbell and Lalor, and H. Carroll Brown & Co., and others proceeded to promote the mine.

It was agreed to organize a Montana corporation, capitalized at 400,000 shares at $5 each, to which all the stock of the Barnes-King Mining Co., and $400,000 cash should be turned over. All the stock of the new company was then to be turned over to the syndicate, of which the managers were H. Carroll Brown, son-in-law of Marcus Daly, Julian M. Girard, also related by marriage to Daly, and one Harkness, employed in the offices of the Daly estate.

The syndicate offered the stock, for which they are said to have given Campbell and Lalor $4 per share, at public subscription at $5 per share. There was a prospectus issued, headed Barnes-King Development Co., a corporation to be organized to develop and equip the Barnes-King Mining Co.'s properties. The circular was not signed, nor did it give any price paid for the stock acquired in the Mining company.

Heinze alleges that on the basis of this circular he purchased 25,000 shares through one Fisher, who paid $62,500 on Nov. 28, 1906. The corporation was organized in November, 1906, according to one story, on Dec. 3, 1906, according to another. Fisher assigned his receipt and rights to Heinze, who made second payment in April, 1907.

As to the financing of the new company, the stock was oversubscribed, and it does not appear that the syndicate managers ever put up any money, but took $400,000 for their profit in the matter. It does not appear that Lalor and Campbell ever put up any money, but paid for the Mining company's stock little by little, issuing and distributing the Development company's stock in the same way. According to a statement attributed to King, of the original company, the original stockholders altogether received $960,000. That is, it is alleged that the Development stockholders' money paid for the stock of the Mining company, the working capital and the promoter's profit. This was not brought out in the trial.

The ore reserves of the company had been grossly misstated in the prospectus, and the crash came soon after it began its career. The Assets Collecting Co. then sued, alleging misrepresentation and fraud.

It was claimed by the defense that the syndicate had a *bonâ fide* existence apart from the corporation, and was not acting as agent of the company. The defense also claims Heinze cannot retain his stock and yet sue the company through the Assets Collecting Co.

On these grounds the defendants have appealed. Ferdinand and Emilie Bullowa represent the plaintiff, Chadbourne & Shores the defendant. In the meantime the syndicate managers are also being sued as individuals.

Allis-Chalmers Reorganization

The reorganization committee of the Allis-Chalmers Co. has just reported on results for the first eight months of the year. Profits and losses, after charging all costs of operation, maintenance and depreciation, but not deducting interest on bonds, have been:

	Profits	Losses
January	.....	29,620
February	.....	22,258
Mar. 1 to Apr. 6	.....	38,783
Apr. 7 to May 31	.....	1,555
June	25,642	.....
July	66,984	.....
August	48,471	.....
Eight months	$141,097	$92,216

The unfilled orders at various dates have been: Dec. 31, 1911, $3,453,085; May 31, 1912, $3,689,506; Aug. 31, 1912, $5,195,669. The deposits of securities under the plan and agreement of reorganization have been:

	Deposited	Outstanding	Per Cent
Bonds	$10,411,000	11,148,000	93.4
Preferred Stock	14,077,600	16,050,000	87.7
Common Stock	17,184,600	19,820,000	86.2

The committee states that additional deposits under the plan of reorganization are promised.

Stratton's Independence

DENVER CORRESPONDENCE

The 1150-ft. level of Stratton's Independence mine is now drained after submergence for eight years. At the conclusion of an extensive development scheme, which resulted only in cutting water courses and draining surrounding mines, the company decided to pull the pumps in the autumn of 1904. The water speedily rose to within 60 ft. of the ninth level, around which it has fluctuated for the last eight years. Now, however, resulting from the driving of the deep drainage tunnel, the 11th level is available for operation without pumping. The Washington vein, in which a strike of rich ore was made last year on the 900 level, will now be opened on the 1150, and the Independence vein will also be prospected at that level. The face of the drift going north on the Independence vein is about 100 ft. south of the property line, and some ore that was valueless eight years ago can now be stoped and milled at a profit. The Portland, which adjoins Stratton's Independence, has sunk to a new level, and it is reported that rich ore has been discovered in a crosscut from the station.

Du Pont Reorganization

The E. I. du Pont de Nemours Powder Co., following anti-trust litigation against it, on Oct. 9, 1912, issued a statement to the holders of its 4½% 30-year bonds, defining the reorganization plan. This statement is, in part, as follows:

Under the terms of the final decree entered by the Circuit Court of the United States in the suit of the United States against the E. I. du Pont de Nemours Powder Co. and others, it has been necessary to create two new companies as follows:

The Hercules Powder Co., a Delaware corporation, whose total assets will aggregate approximately $13,000,000. This company will issue $6,500,000 par value 6% 10-year gold bonds, redeemable at 102% and interest. The estimated earnings of the company are equal to three times the annual interest charge on the proposed issue. The entire interest will be guaranteed by the E. I. du Pont company.

The Atlas Powder Co., a Delaware corporation, whose total assets will aggregate $7,000,000. This company will issue $3,000,000 par value of 6% 10-year gold bonds, redeemable at 102% and interest. The estimated earnings of the company are equal to three times the annual interest on the proposed issue, which is guaranteed by the E. I. du Pont company.

The trust agreements under which these bonds will be issued may be inspected at the office of the Guaranty Trust Co. of New York as soon as the forms of bonds are approved by the court.

The decree requires that both the $6,500,000 of Hercules Powder bonds and the $3,000,000 of Atlas Company bonds shall be delivered to the E. I. du Pont de Nemours Powder Co. in part payment for the properties transferred by the latter to these two new companies. The decree further requires that one-half of these bonds or the proceeds shall be distributed.

Prussian 1911 Mineral Production

The mineral production of Prussia for 1911 is officially reported as follows: Bituminous coal, 141,012,103 metric tons; lignite, 46,642,997; asphalt, 19,956; petroleum, 98,611; salt, 359,102; kainit, 2,456,680; other potash salts, 191,658; iron ore, 4,944,928; zinc ore, 696,900; lead ore, 123,787; copper ore, 857,517; nickel ore, 9608; arsenic ore, 4476; manganese, 86,902; pyrites, 202,136 metric tons. In the case of coal, these are the effective commercial productions, mine consumption being deducted. Among byproduct productions of the Prussian works in 1911 we note 42,575 kg. of cadmium and 500 kg. of selenium.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Practical Accuracy

I have been interested in reading in the JOURNAL of Sept. 28, 1912, a letter from James G. Horton, of Colorado Springs, in which he expresses disagreement with the substance of your editorial on the subject of "Practical Accuracy." It appears to me that the critic has hold of the wrong end of the subject, for an operation is not more perfect, when performed in an imperfect way, simply because the operator happens to know the way to perfection. I suppose no one will question the fact that methods of assaying have reached a state of perfection such that gold and silver can be estimated with accuracy when the desire is to do so. These methods are "absurdly easy, both in principle and practice," when one knows how, which almost every assayer does, but that fact does not save the operator from being "medievally imperfect" when he deliberately uses a method which he knows may be misleading. Perhaps the fault is not with the assayer, and if I remember correctly, your editorial did not say it was, but if not he, then someone else is responsible for it, and it is none the less imperfect.

The whole point of the argument lies in the fact that mill operators want to know what they are doing, and depend on the assay to let them know the facts. When reduction processes claim to be recovering 95, 97 and 98% of the original ore content, as many of them are, then something more than an "inexpensive approximation" is necessary to justify their claims. Suppose a mill were operating on $10 gold ore, and many of them have less than that to work on, and getting a tailing supposed to contain anything from 10 to 50c., is a tailing assay made on ½ a.t. worth anything at all as a basis of calculation? I think it is not, because the resulting button is too small to be accurately weighed and is more than likely to be guessed at and called a "trace" or some other small figure which may or may not be correct. In view of the practice of assayers to operate on such small quantities of pulp, there is little wonder that calculated extractions and bullion recoveries so often fail to coincide. The above mentioned reasons are outside of the fact, which is well recognized, that a large quantity of pulp is far more likely to be a fair sample than the minute quantities often used for assay.

It appears to me that doing faulty work on account of the extra cost of accurate assaying is rather unreasonable. In this day, when huge sums of money are being spent on accurate mechanical sampling and weighing plants, it is poor policy to balk at the comparatively insignificant cost of accurate tailing assays. Of course, there are many instances where accurate assays are not necessary, such as reconnaisance work in mines, etc., but where calculations of critical importance are based on a comparatively few tailing assays, as in mill work, these assays ought to be correct, as near as it is humanly possible to make them, and if they are not, then they are likely to be incorrect and ought not to be offered as proof of what is being done in a mill.

REZONGADOR.

Toronto, Oct. 2, 1912.

Feed Gate for Coarse Ore

I read with interest the illustrated article in the JOURNAL of July 13, 1912, on "Feed Gates for Coarse Ore." Being the originator of these gates over nine years ago while with the St. Louis Smelting & Refining Co. as assistant superintendent, I, of course, took careful note of the comments in the article, especially the suggestion of the writer to operate these gates with an air cylinder. The salient feature of this gate, of course, is that it is undercut and boulders can in no way interfere with its operation. Before deciding upon the manner of control I gave various power devices due consideration.

Compressed air being available at all mining operations no doubt would cause air control to suggest itself to many. My previous experiences with air cylinders used for similar purposes had not been satisfactory; being unsteady in their action in overcoming loads of varying resistance, they cause severe shocks to apparatus of this character. In most mining communities the freezing weather in the winter months prohibits the use of air for such purposes and when ore containing much water freezes solid in these gates nothing but a positive and slow acting device like the worm and worm gear employed would meet such conditions effectively. At two of the outlying shafts at this property each of the storage bins was equipped with 14 gates of this design, but smaller, and I have seen railroad cars loaded in three minutes, which would hardly signify that the action is too slow. The main point is these gates may be operated *always*.

Since I have not patented this gate and since the public is free as to its use I am naturally anxious that those who desire to use them get the highest satisfaction therefrom, which may be obtained I believe only by the slow acting but always ready and positive combination of worm and worm gear, which automatically locks itself in any and all positions of its movement. J. O. BARDILL.

Herculaneum, Mo., Sept. 23, 1912.

Bolivian Tin Mining

In the article on Bolivian tin mining, published in the JOURNAL of Aug. 10, 1912, Mark R. Lamb states: "A proof that classification is faulty is the fact that mill tailing is successfully washed by hand without further grinding."

My experience is, that two other facts have a more important influence on the quantity of free cassiterite in mill tailings of Bolivian tin ores, viz., the high content of the ores in tin, and the inefficiency of Bolivian labor. I can prove this by the following: In the concentrating mill of the Cia. Minera de Oruro at Machacamarca the classification is now exclusively done by Richards-Janney classifiers, which do excellent work; yet the mill tailings are concentrated by hand at a profit. There is no doubt that with the improved classification the amount of free cassiterite in the tailing decreased considerably as compared to the time when the pulp was classified in spitzkasten.

It is not at all uncommon in this country for the milling ore to run as high as 15% tin. To make tailings of this kind of ore so poor that there is no cassiterite left in them which can be recovered by hand washing at a profit, it is necessary to build complicated mills, in which the tailings and middlings of the apparatus that treat the fresh ore, are retreated several times. In the mill to which I referred, tailings from the jigs, after recrushing in Huntington mills and classification, are concentrated on Humboldt tables. Even if the classification is perfect, the tailings from these tables will contain as much as 1% tin in extremely fine cassiterite.

Owing to the scarcity of labor in Bolivia, one has to use any available laborers as tablemen. Some of them will soon get an idea about the work, but the majority are almost useless through their

lack of observation. Middlings may run for hours on the mill floor, or into the wrong launder, or the spigot of a classifier may discharge outside of its own pipe or launder, but the Bolivian tableman pays no heed to this and only occupies himself with making the concentrates run into their box—and even this he sometimes neglects. I believe that leakages and such accidents have the greatest influence on the high tin values of the tailings of Bolivian concentrating plants.

Mr. Lamb observes that Bolivian youths of the better classes are educated in European countries, where to work is a disgrace. In the first place, the Bolivian youths that go to Europe for their education are few and far between; the countries they generally go to are France, England and Germany, and I certainly do not think that it is an acknowledged fact that work is looked upon as a disgrace in any of these countries.

M. G. F. SÖHNLEIN.

Machacamarca, Bolivia, Sept. 9, 1912.

Alumina in Slags

Referring to the abstract of the paper by H. C. Bellinger on alumina in slags, in the JOURNAL of Aug. 17, 1912, p. 321, I wish to call attention to the following analysis of a slag I have just seen: SiO_2, 37.4%; FeO, 24.6; CaO, 15.3; ZnO, 9.0; BaO, 5.8; Al_2O_3, 6.4; CuO, 0.4; S, 0.8; total, 99.7%. The matte carried 38% Cu. (It seems murderous metallurgy to waste 11% of zinc to save 4% of copper, but that is what was being done.)

This slag behaved like an acid slag when a bar was dipped into it, and gave threads several feet long, when drawn rapidly. The 4½x20-ft. furnace smelted 360 tons per day, with 19,000 cu.ft. of blast per min., and 8.3% of coke. It would be interesting to have an authoritative guess, whether the Al_2O_3 here is an acid or a base.

Also, is this slag a Monalisa silicate or a polyphase compound full of dried currents and short circles, and would it be more profitable to have more ROX on the charge?

The zinc does not cause any trouble providing there is enough oxidation in the furnace to give a matte of over 38% Cu, but if the matte gets down to 30% or less, the zinc then present in the matte to the extent of over 12% will separate as a mush and freeze up the tap holes in furnace and settlers.

In this raw or pyritic smelting the grade of the matte and furnace oxidation is regulated by: (1) By the amount of coke; (2) the height of the furnace; (3) the quantity of blast; (4) by placing the coarse pieces of charge near the walls, and the fines in the center of the furnace.

Personally I prefer to rely on the bar test for the acidity or basicity of a slag, rather than to some hypothetical behavior of some of the ingredients, or a volume of symbols. H. B. F.

Mexico, D. F., Oct. 5, 1912.

Park City Record

The report of the Park City district, recently published by the U. S. Geological Survey, as Professional Paper No. 77, and referred to in the JOURNAL's editorials of Aug. 3, and Aug. 24, 1912, but without technical criticisms, has been received in Utah. The report, as is well known, has been delayed a number of years in publication, the field work having been completed in 1904. Efforts have been made at various times by Utah mining men and especially by people interested in Park City to hasten the publication.

Opinion among the Utah men with whom I have talked regarding this report is rather mixed, but the general sentiment seems to be that Mr. Boutwell does not do himself or Park City justice, as compared to his earlier work in Bingham.

There are, of course, things in the report which are of value, such as the working out of the stratigraphy of the district, the distribution of igneous rocks, and mapping of the principal faults, etc. There is a large amount of detailed information concerning the district, such as the history, production and description of the 45 ore minerals, etc. There are inaccuracies in regard to the milling and treatment of the ores, for which Mr. Boutwell is to be pardoned, as these are out of his line. While the report is generally regarded as a "has been," there is a large amount of data, which will be made use of by Park City operators.

OPERATORS.

Park City, Utah, Sept. 2, 1912.

Illuminating the Cross Hairs in Mine Surveying

The methods described in the JOURNAL of Sept. 28 and Oct. 12, 1912, under the title "Illuminating the Cross Hairs in Mine Surveying," are both good. I have used the tracing cloth between the plumb-bob string and the light in Pennsylvania bituminous-coal mines with good results, but it has the disadvantage of getting dirty and wet, which renders it useless.

The following method, by Charles A. Cadwell, formerly professor of mining, Case School of Applied Science, gave good service with our students in mine surveying at Case. It consisted of a lantern 5 in. square by 8 in. high, with a ventilator on top and a hook for carrying it; a socket was soldered in the middle of the bottom for holding a miner's candle; three of the sides were closed by panes of plain glass 5x8 in., set in vertical slots in the frame; the fourth side was a pane of ground glass of the same size as the others; the frame itself was made of tin and the whole lantern cost about 50 cents.

In using this lantern, the ground glass was placed behind the plumb-bob string and the light of the candle was thus diffused, so that a good clear sight could be obtained, even though working in a strong air current, as the candle being inclosed was unaffected. As the lantern is bulky for ordinary use, I would suggest mounting a piece of ground glass in a tin or wood frame with a hook attached for carrying. This, with an acetylene lamp behind it, will give good results, and the glass can be rubbed or washed when dirty..

HUGH D. PALLISTER.

State College, Penn., Oct. 14, 1912.

Fine Grinding of Ores

Many of our assayers have carried the subject of fine grinding of ores too far and the tests described on page 446 of the JOURNAL of Sept. 7, 1912, ought to serve as a warning and a guide to the advocates of extremely fine grinding.

There is a perfectly natural explanation of the low results obtained in assaying the very finely ground samples in these tests. Fine grinding promotes fusion, but if the fusion take place too rapidly, the particles of reduced lead sink through the charge to the bottom of the crucible too soon and become practically inert as gatherers of precious metal, before all of the gold and silver in the ore has had an opportunity to alloy with the lead. Unless the particles of reduced lead are held in suspension in the melting charge a sufficient length of time, the results are bound to be low.

If one is obliged to assay very finely ground ore, it might be well to add to the charge a small amount of fusion-retarding material, such as 100-mesh bone ash, finishing the fusion at a slightly higher temperature than usual. This explanation is applicable to other conditions in ore assaying and in my judgment too rapid fusion, by whatever cause produced, is responsible for many differences in assay results.

FREDERIC P. DEWEY,
Assayer, Mint Bureau.

Washington, D. C., Oct. 9, 1912.

Selenide of Gold

In the treatment of copper containing 0.4% selenium, I find there is a considerable loss of gold in the fire processes, that is to say, in melting for anodes, and in fire refining of electrolytic slimes to bullion. The slimes contain 15% selenium.

Is selenide of gold very volatile and have any of the JOURNAL readers experienced like losses in anode furnaces and in the refining of slimes?

SELENIDE.

New York, Sept. 17, 1912.

Review of Butte Geological Report

By Reno H. Sales*

The field work for the Butte report was concluded by Walter Harvey Weed in 1905, but seven years elapsed before the publication of his results by the U. S. Geological Survey. The value of the report is further lessened by inconsistencies in the text and by inaccuracies in the illustrations. The important question as to whether chalcocite is a secondary or primary formation is but superficially treated.

*Geologist, Amalgamated Copper Co., Butte, Mont.

Note—The Geology and Ore Deposits of the Butte District, Montana. By Walter Harvey Weed. 9x11½, pp. 262, illus.; 40 plates; cloth. Professional Paper 74, U. S. Geological Survey.

The long looked for report on the geology of the Butte ore deposits has at last appeared. The study of the geology of Butte was undertaken in 1896. This work was shortly followed by the publication by the U. S. Geological Survey of the Butte Geologic Folio in 1897. Rapid and extensive mine development soon permitted of a more thorough and comprehensive study of these interesting deposits, so that in 1901 W. H. Weed was detailed to make an exhaustive study of the district. The field work was carried on more or less intermittently until its completion in 1905.

Delay in Publishing Report

A period of nearly seven years has elapsed from the time of completion of the field work and the publication of the results of the author's work. Needless to say, both the author and the officers of the Survey will receive a goodly amount of well deserved criticism for this inexcusable delay. A lame apology is offered by the author in his statement that "owing to the magnitude of the task and the pressure of other investigations, it was not completed until the autumn of 1905. The work of assembling, platting and checking the mass of detail collected has been very great, hence the completion of the report has been delayed. The chief cause of delay, however, is the litigation that has been in progress in the district and the assurance given that the report would not be published in time to be used by either litigant." The Survey officers offer no apology for the tardiness of the report, the reader being left to infer that the excuse of the author is deemed by them as sufficient.

The U. S. Geological Survey and its investigators have many times been severely criticized, and rightly too, for their indifference and neglect toward, not only the interested public, but those who gave them the freedom of their properties and works for the purposes of scientific investigation, and who are entitled to the earliest possible economical advantages to be gained through the publication of the facts thus secured.

As long as the officers of the Survey permit either "private examinations" or "other investigations" by the members of the field staff, just so long will the curse of "delayed reports" cling to an otherwise extremely important, and efficient branch of our Interior Department.

The "litigation" mentioned by the author was brought to a definite close on Feb. 13, 1906, hence the statement that the "chief cause of the delay is the litigation" has no foundation in fact. Somebody has been grossly negligent, and there is no valid reason why the report should not have appeared as early as 1906, or even prior to that date. Again, the report might have been made infinitely more valuable by a short re-examination of the district, bringing the essential features up to date.

Early History

The text deals with the early history of the district, followed by a description of the geology of the ore deposits and the surrounding district. Placer mining began in the early 60's followed by quartz mining, the first location being made in 1864; while some of the most important copper veins were located as early as 1864, they were taken up as silver veins, and not as copper veins. The silver mining reached its zenith in the late 80's and practically ceased in 1893, following the drop in price of silver. Copper mining began in earnest in the early 70's and has continued almost uninterruptedly to date. The district passed through a period of bitter and costly litigation from 1896 to 1904, the cessation of which was brought about by consolidation of the various warring companies. Up to 1906, Butte had produced a total of 3,961,000,000 lb. of copper; 194,000,000 oz. of silver and 971,000 oz. of gold.

The ore deposits are essentially fissure-vein deposits. The rocks are all igneous, the ores occurring principally in granite or quartz-monzonite. The granite has been intruded by aplite and rhyolite porphyry, both prior to the veins in age. Later rhyolite eruptions took place, forming the volcanic plug known as Big Butte, and covering the northwestern portion of the district with rhyolite lavas, tuffs, etc. That the rhyolite is subsequent to the oldest vein formation is proved in numerous instances, where the rhyolite may be seen cutting off the veins.

The granite of the Butte veins is a part of a large granite mass 64 miles long and 15 miles wide, reaching from Helena on the north to the Highlands on the south. This great granite body is termed the Boulder batholith. It made its appearance probably immediately after the Rocky Mountain building period, at the close of the Cretaceous times. It was preceded by rather extensive bodies of andesite and andesitic lavas. The batholith itself has been intruded by one or more large bodies of dacite-rhyolite, and many minor rhyolite intrusions. No sedimentary rocks occur in the immediate vicinity of Butte.

Two Classes of Fissure Veins

Locally in the Butte district the granite and rhyolite porphyry have been much fissured. The author has classified these fissures into groups or systems, mainly according to age, or perhaps, in part, according to trend in direction. Two general classes are first given; namely, those formed before the rhyolite eruptions, trend either (a) east and west, or (b) northwest and southeast; the second, accompanying or following the rhyolite intrusions. Still later northeast fracturing occurred cutting orebodies. As fissure systems, these general groups are divided into five distinct systems, which are again grouped as vein and fault systems, according to age, as follows: Vein systems: (1) The Anaconda (east-west or quartz pyrite) system; (2) the Silver Bow or High Ore system; (3) the Blue vein or northwest system; (4) the Steward system. Fault systems: (1) The Mountain View system; (2) Rarus Fault system; (3) Post-Rarus Fault Fractures.

Anaconda System Most Important Commercially

The Anaconda system includes the oldest veins geologically and they are the most important commercially. Included in this system are the Anaconda, Syndicate, Colusa and other important producers. In the Anaconda system the fractures are continuously mineralized, exhibiting remarkable uniformity in width and mineralogical character. They are heavily mineralized with quartz, pyrite, chalcocite, bornite, enargite, with sphalerite and tetrahedite in places. The orebodies have resulted from the mineralization of fractures or shear zone, having but slight displacement. The country rock has been more or less replaced adjoining these fractures, so that the line of demarcation between ore and country rock is often indefinite.

The Silver Bow system includes a number of important veins having a northwest and southeast strike. They appear to be old quartz-pyrite veins, pos-

sibly of the Anaconda system, along which more or less strike faulting has occurred, giving them an intermediate position between old quartz-pyrite veins and the typical fault veins of the Blue system. The author, however, does not make clear these age relations, and from his descriptions one is led to doubt the advisability of separating the Silver Bow veins from the Anaconda or east-west system.

The Blue veins are mineralized fault fissures, regularly spaced, which intersect and displace the veins of the Anaconda system. The ore, which occurs in great lenses or shoots, is somewhat similar to that of the Anaconda veins, excepting that it is higher in silver, and the minerals are more typical of the silver veins. The vein filling is usually zinky near the surface, changing to copper ore at a few hundred feet depth. The principal minerals are sphalerite, tetrahedrite, rhodochrosite, fluorite, galena, pyrite, chalcopyrite, bornite and enargite.

The Steward fissures are less mineralized than the earlier veins. They cut and displace the older veins and often form strike faults along them. They contain remarkable shoots of conglomerate ore, composed of fault breccia, fragments of older veins, and later formed ore. The Steward veins, in general, carry more enargite contrasted with older veins, and carry also minerals typical of the silver veins.

The Mountain View, Rarus and Post-Rarus fault systems do not carry ore other than fragmental ore broken from older intersected veins. The Mountain View faults are breccia faults having slight displacements, and are believed to have resulted from shrinkage, or contraction in the granite.

Zinc and Copper Minerals in Veins

The minerals forming the great bulk of the vein filling of the district are quartz, pyrite, sphalerite, chalcocite, enargite, bornite, and chalcopyrite, with varying amounts of tetrahedrite, covellite, rhodochrosite, fluorite, etc. As mined, a large portion of the ore is composed of worthless altered granite which forms "horses," bands, separations, etc., within the vein boundaries.

The great bonanzas of chalcocite are the result of secondary-enrichment processes. The old quartz-pyrite veins are unworkable, except where they have been faulted or fractured, and later enriched by the addition of large quantities of chalcocite brought from the oxidized zone by downward-seeping surface waters. In the principal veins of the old quartz-pyrite series, enargite appears only in the deep workings, specifically, from the 2000-ft. level downward.

Generally enargite is later than the oldest quartz-pyrite vein filling and occurs either in fault veins or filling fractures in the old veins. But little, if any, of the enargite in the district is regarded a product of descending surface waters, because the author states that chemical analyses showed but a trace of arsenic in the primary pyrite, hence the secondary derivation of enargite from the primary vein filling was not within the range of possibility. To the reader this seems a startling statement, considering that the text describes many examples of large rich enargite orebodies, extending upward to the oxidized zone, with no oxidized minerals of copper or arsenic remaining in the oxidized portions of the veins. To one unfamiliar with these deposits, it would appear that the existence of large bodies of secondary enargite might well be expected to explain the disappearance of both the copper and arsenic from the oxidized zone.

Granite Altered Near Veins

In and along the veins the granite has suffered intense alteration. Solfataric waters and gases rising through the fissures have converted the iron of the granite into pyrite, and enormous quantities of sericite have been developed. The altered granite near the veins is found to be composed almost entirely of sericite and quartz. This sericitized granite plus the newly formed disseminated pyrite is termed "pyritized" granite.

The portions of the vein nearest the surface have been oxidized to a depth of 20 to 400 ft. There is but little indication of copper in the vein outcrops, and the typical iron gossan is entirely absent. It is believed by the author that the present oxidized zone is the result of the oxidation of enriched portions of the veins, and not the oxidation of the primary or original quartz-pyrite vein filling which would yield a much greater quantity of iron oxides than are found in the existing outcrops.

Separating the district into vein groups or areas, the author proceeds to describe the veins and faults in great detail. In this method of attack, however, there results considerable confusion in the mind of the reader, because the relative positions of these described areas are not made clear in the beginning. Further difficulties of understanding are met when a given vein is described under separate general headings resulting in needless repetition and confusion.

A meritorious feature of the book is the excellent descriptions of the veins and ores. During his wide experience as a field observer and as a writer upon the subject of ore deposits, the author well learned the art of sifting out essential facts from a great mass of detail.

Problem of Chalcocite Formation Unsolved

One of the most important problems of this district, or perhaps of the whole subject of copper deposits is that relating to the matter of formation of chalcocite. Butte has been often referred to as the classic example of secondary chalcocite, and it is often cited as a remarkable example of secondary sulphide enrichment.

Recently certain geologists have expressed the opinion that the Butte chalcocite is largely primary, and that only the sooty chalcocite deposits of the relatively higher levels, are known to be secondary. Dr. Weed, however, practically dismisses the subject by the general statement that the chalcocite is largely secondary, but in part primary.

Not much weight can be attached to the author's argument, that all the existing mine water of the district is descending and of atmospheric origin, because in a newly opened drift in a deep level, water was observed dripping from the roof while the bottom of the drift was dry. A further search might have found a drift bottom wet with the roof dry, since the author is emphatic in his belief that the descending waters find their way to great depths through fissured crackled veins which are more or less definite channels or water courses.

The author's detailed descriptions of the veins and ore fail to mention a single example of chalcocite which he believes to be primary. No evidence is offered in support of his belief that this mineral is in part primary. This problem is one of vital importance, and it should not be lightly passed over when a most remarkable opportunity is offered for study.

Other matters of highest importance, and of the greatest interest to those concerned in the study of ore deposits, are but scantily treated. The question of rock alteration as related to ore deposition is only barely touched upon. When viewed in the light of comparison with the brillant and masterful work of Lindgren on the Morenci district, the reviewer feels but a sense of pity that such exceptional opportunity has been lost to the author of the Butte report.

Many Inconsistencies in Report

The labor required to digest the great mass of material gathered in the field will be well appreciated by those who read this report, yet it will not be easily understood how so many inconsistencies crept into the text, especially after the author states that the work of "assembling and plotting was very great," resulting, in fact, in the delay of the publication. No attempt will here be made to enumerate all of them; a few, however, will be given.

On p. 63, it is definitely stated that the Clear Grit silver vein fissure cuts and displaces the Steward vein, and with it all earlier veins. This statement is supported by Plate XIX, which distinctly shows a marked displacement of the Steward Fault fissure by the Clear Grit vein. The author deals at length with

the evidences tending to support this conclusion. On p. 114, the following statement appears: "The evidence in the Steward mine shows that the Clear Grit vein cuts and displaces the north branch or north vein of the Steward mine, which is regarded as the old vein, but is itself cut off by the Steward fault vein." This statement is corroborated by further statements and by actual sketches illustrating the age relations (see Figs. 53, 54 and 55, p. 149). And again, in support of this position, Plate XXIII may be cited, showing a positive cutoff and displacement of the Clear Grit by the Steward vein. The confusion in this instance has undoubtedly arisen through the misuse of the name Steward, which is used generally throughout the report to designate a series of northeast faults of the same age as the Steward fault. On the plan maps the old quartz-pyrite vein of the Steward mine is at one time called the "Steward" vein, and at another the "Old Steward" vein, while in the text this vein is termed the Acquisition vein, the name "Steward" being used only to designate a later fault fissure.

Another instance might be cited tending to show confusion of ideas or a careless presentation of facts on the part of the author. On p. 106, in his classification of copper-vein systems, there is included within the Silver Bow system, the High Ore, Wild Bill and others, which system is described as being older than the Blue fault veins. In the Blue system is included the Covellite and others, all typical fault fissures. In general discussions throughout the report, the Wild Bill vein is placed in the Silver Bow or High Ore systems, yet on p. 179, the reader is confronted by the statement that "it (the Wild Bill) is a typical fault vein" and again on p. 186, the statement, "As already shown (p. 179), the Wild Bill is a fault vein belonging to the Covellite group."

Apparent discrepanices of this nature might be many times multipled. A notable one occurring on plates XXVIII and XXV, the former showing a marked displacement of the Blue Jay fault by the Blue vein, while the latter shows the Blue Jay cutting and displacing the Blue. There seems to be no plausible excuse for the representation upon plates XXV, XXVII and XXXVII of the rhyolite dikes cutting through and displacing portions of the Anaconda veins near the St. Lawrence shaft, when it is so clearly shown that the porphyry antedates the Anaconda vein.

Forgetting for the moment these discrepancies between text and maps, the maps themselves (plates XIX, to XL are neat and clear illustrations, and convey to the reader a far better understanding of the vein structure of the copper district than can be conveyed by description. In one respect the legend is deficient. The blue coloring for faults and veins does not always mean "unmineralized veins and faults," and furthermore, "unmineralized vein" is not in accordance with good usage at the present day. While the blue coloring of the legend infers "unmineralized fissures," many of those colored blue on the map are mineralized and are big ore producers.

An accurate cross-section map reaching north and south through the whole district colored to conform with the plan maps, would add much to the general understanding of the vein structure as a whole.

Of the map denoted Plate X, the less said the better. The reader of the monograph will not seriously attempt to further his knowledge of the complicated structure of the copper deposits by means of this wretched exhibit purporting to be a map upon which, quoting from the author, "the outcrops of the mineral bearing veins have been platted with great care by the aid of a plane table. . . . It is, however, deficient in some respects and should be checked by comparison with the maps showing the veins and geologic features developed by mining and reduced to a definite horizontal plane." It is unecessary to state that, had the author himself performed the task above suggested, Plate X would have taken on a decidedly different complexion regarding vein and fault structure.

No Map Showing Continental Fault

In the first place, it is unfortunate that the map does not cover the eastern portion of the district, embracing the property of the Pittsburgh & Montana Co., and also the region of the Continental fault. It is well known (see lower left-hand corner of map Plate X) that a special enlarged edition of the Butte sheet was published years ago, covering all of the district and extending as far eastward as the top of East Ridge, four miles from Butte. The position of the Continental Fault, which is accorded much prominence in the text, is, therefore, necessarily left largely to the imagination of the reader.

As an outcrop map, the sheet is most unattractive with its littering of city streets, buildings, railroads and the like. A serious blunder was committed when contour lines and copper vein outcrops were given the same color. The vein colorings on the map are entirely inconsistent with the descriptive matter of the text. For example, the Edith May, Jessie, Gem, and many other veins, are described as being immense copper producers, yet they are given the silver-vein color on Plate X. The most talked of error of the outcrop map of the Butte Geologic Folio, namely, the displaced segment of the Windlass vein, by the Rarus fault to the south, is intensified on the present map by the careless handling of the printer's ink.

The publication of a map of this character can have no justification. The author calls it a revision of the economic sheet accompanying the Butte Special Folio, published in 1897. A comparison of the two will show that the old map is neater, more attractive, just as accurate in detail, and by far, a more creditable piece of work.

Errors in Illustrations

Several errors are to be noted in woodcut illustrations throughout the text. On p. 64, in Fig. 6, the large cross fault marked "Blue Vein" should read "Rarus Fault." The Blue vein does not intersect the St. Lawrence workings as shown. The illustration on p. 201, Fig. 89, does not represent a truncated segment of the Mountain View South vein, but the faulting of a vein of the Blue system lying many hundreds of feet north of the Mountain View south vein. Compared with plates XIX to XL in pocket, Fig. 77 is an incorrect representation of the position of the Bell fault. The Bell fault is not intersected either by north or south crosscuts from the Gray Rock shaft.

It is to be much regretted that the Geological Survey did not see fit to have a full revision of Dr. Weed's work before permitting it to go to press. Enormous development has taken place in the Butte district in the last six years, and many of the perplexing problems met with prior to the time of Dr. Weed's work have been cleared up. No doubt many new facts relating to structures and ore deposition are now available. In fact it is well known that the whole area is extensively opened up laterally and to considerable depths, so that a present-day exhaustive report would, in all probability, need but slight revision, if any, in the future.

Mount Morgan Gold Mining Co.

The report of the Mount Morgan Gold Mining Co., for the year ended May 31, 1912, shows 351,858 long tons of ore treated, from which were produced 7440 long tons of fine copper, and 134,575 oz. of gold. Total revenue amounted to £989,714, and expenses to £731,715. Dividends of £150,000 (15%) were paid.

Four new blowers have been installed in the reduction works, and four furnaces are now being run there. Experiments have been made on the treatment of the "mundic" ore in the blast furnaces, and, as a result, three out of eight "mundic" furnaces were closed down, and the other five will be closed soon.

Friends of this old company will be pleased to see that a redetermination of the auriferous copper-ore reserves shows

3,526,000 long tons, as compared with 2,809,000 long tons estimated in 1906, and after 995,000 long tons have been extracted.

Kerr Lake Mining Co.

The report of the Kerr Lake Mining Co. for the fiscal year ended Aug. 31, 1912, shows a silver production for the year of 1,855,495 oz., of which 1,741,804 oz. were produced from high-grade ore and 113,691 oz. from milling ore. The net profits were $703,209, of which dividends called for $690,000. Production costs per ounce of silver were: Mining, 12.1c.; shipment and treatment, 5.55c.; administration and general, 0.65c.; total, 18.3 cents.

The first-class ore, 850,007 lb., carried 1,451,993 oz.; second-class, 489,407 lb., 85,350 oz.; jig and table concentrates, 324,088 lb., 203,253 oz.; beside which the bullion from the metallics carried 11,208 oz., and mill ores 113,691 oz. Silver in ore reserves is estimated at 2,829,100 oz. in high-grade mine ore, and 1,049,591 oz. in mill and dump ore available, while 2,781,400 are under the lake, making a total of 6,660,091 oz. The general comment is made, "In considering the available ore, it is necessary to take into account that the time has gone by when production could be made by comparatively few cars of ore taken from wide veins containing in places, nearly solid metallics, from small stopes within easy reach of the track, or simply from development. The veins now available for working, although still rich and capable of regular production if rightly worked, are in general narrower, and have their working faces more inaccessible than formerly. Much more waste or low-grade rock must be handled to obtain the same number of ounces, and more time is needed to mine the ore."

Missouri Mine Tailings

During the last few years the chats or tailings produced in the Joplin and the Flat River districts in Missouri have become a considerable article of commerce. They are used for railroad ballast by the railroads running through those districts; for road material, and to some extent for making concrete. The Missouri Geological Survey estimates the quantity thus used for three years past as follows, in tons:

	1909	1910	1911
Railroad	355,901	1,009,533	865,011
Commercial	472,934	610,789	638,592
Total	828,835	1,620,322	1,503,603

During 1911 there were approximately 1,015,800 tons shipped from the southwest zinc district, while the southeast lead district shipped approximately 487,000 tons.

It is believed that the commercial use of these tailings could be largely increased. H. A. Buehler, state geologist, comments on this use of chats for concrete aggregates as follows:

> No tests have been made as yet to determine the value of chats as compared with other materials for concrete aggregate. Occasionally one hears some complaint about the use of tailings in which there is a rather high percentage of marcasite or pyrite. Apparently the oxidation of these minerals affects the strength of the concrete which is probably due to the fact that through oxidation a portion of the sulphur forms sulphuric acid which would readily dissolve the cement binding. However, where the tailings are free from these minerals they are well adapted for commercial purposes, and their use could be greatly extended in commercial work.

Palmaer Bicalcic Phosphate

Prof. W. Palmaer proposes to transform the Canadian apatite deposits into commercial fertilizers. Before the International Congress of Applied Chemistry, Professor Palmaer described his bicalcic-phosphate manufacture, a portion of the process for utilizing low-grade phosphates. It was proposed long ago to produce bicalcic fertilizers by leaching phosphate rock with hydrochloric acid, and precipitating the solution obtained with calcium hydrate. However, owing to the high price of hydrochloric acid, the process has only been used commercially as a byproduct reaction in the manufacture of glue, i.e., the mineral portions of fresh bone are dissolved in dilute hydrochloric acid, and this solution is later treated with lime, obtaining valuable bicalcic phosphate.

In the Palmaer process the hydrochloric acid is replaced by perchloric acid, which is electrolytically regenerated. The cost then becomes a function of the cost of electric power. The process consists in electrolyzing sodium perchlorate in a diaphragm cell, producing perchloric acid and sodium hydrate. (Or sodium chlorate may be used initially and the chloric acid will be oxidized at the anode during electrolysis, after which the process becomes the same.) The weak anode solution is then used to leach phosphate rock. The leach is then drawn off and brought down to faint acidity with about one-half the cathode alkali solution, after which the bicalcic phosphate precipitates as a fine crystalline powder which can be washed.

In the meanwhile, the other half of the cathode liquor is converted to carbonate by passing flue gas through it. This is added to the filtrate from the bicalcic precipitation, and the lime in solution is thrown down as carbonate, regenerating pure sodium perchlorate.

Dr. Hjalmar von Feilitzen read a paper before the section on Agricultural Chemistry, in which he gave tests of the "palmaerphosphate" on peat lands, which were highly favorable to the new fertilizer. The process allows the production of a fertilizer containing 35 to 38% of citrate-soluble P_2O_5 from low-grade rock. It is also stated that there is no tendency to "revert," even in the presence of large amounts of iron and alumina. A small plant is now working at Tröllhattan, Sweden.

California Oil Dividends

Dividends paid by California oil companies during the month of September amounted to $602,764, says the San Francisco *Chronicle*. Not many quarterly dividends were paid, but in October there will be several that will make the total larger. The following is the list:

Amalgamated	$1.00	$50,000
American Petroleum pfd.	0.005	8,756
American Petroleum, com.	0.001–3	39,607
Caribou	0.001–3	8,070
Central	0.0075	7,500
Claremont	0.01	5,000
Columbia	0.01	9,992
Del Rey	....	3,000
Euclid	....	1,750
Home	0.01	5,000
Midway Premier	0.01	5,000
Monte Cristo	0.025	12,500
Mount Diablo	0.015	7,500
New Pennsylvania	0.005	5,000
Pacific Crude	0.10	60,000
Paraffine	0.01	3,000
Record	0.01	5,000
Rice Ranch	0.015	4,500
S. F. & McKittrick	0.01	5,000
Sauer Dough	0.0075	2,992
Section Twenty-five	0.50	20,000
State Consolidated	0.01	5,000
Traders	0.006	9,000
Union Oil	0.006	184,744
Union Provident	0.006	91,402
United Petroleum	0.006	48,451
W. K.	0.02	10,000
Western Union	0.005	5,000
Total California companies		$602,764

Potash from the Salines of the United States

J. W. Turrentine, of the Bureau of Soils, reported a great number of potash determinations on brines from various sources to the International Congress of Applied Chemistry, and then stated that his conclusions were as follows:

From theoretical considerations it appears improbable that the known deposits of rock salt in the United States east of the Rocky Mountains are associated with potassium salts other than small amounts occluded and absorbed during crystallization of the sodium chloride. In no cases do the artificial or natural brines or their concentrates contain sufficient potash to make them of commercial value. Certain Western desert-basin brines suggest interesting possibilities of these. Searles Lakes, San Bernardino County, Calif., and Railroad Valley, Nevada, are the best, showing over 6% of K_2O content in the total salts. The sea-water bitterns, when evaporated, give commercially valuable manure salts, but the amounts of the mother liquors are too small to make a production comparable with the country's total consumption.

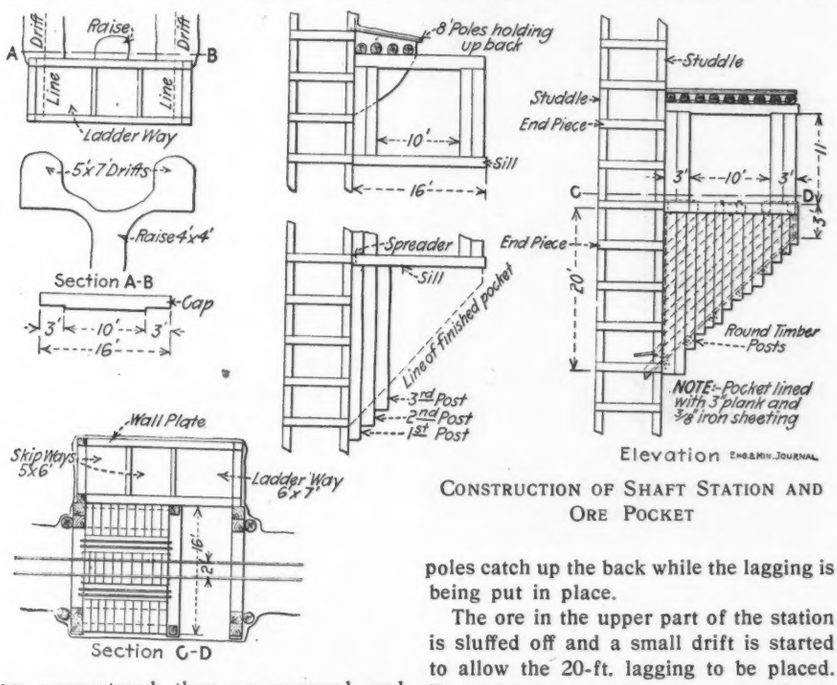
Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Cutting a Station and Pocket in Ore

By L. D. Davenport*

In preparing for the cutting of a station and pocket in an orebody, lines for two small drifts are set on the wall plates 1 ft. inside of the studdles. Two 5x7-ft. drifts are started on these lines, and at the same time, a small raise is started at a distance of 20 ft. below these drifts. A temporary chute is built at the bottom to direct the ore into the bucket in the shaft. This raise runs up along the shaft, and as the blocking and wedges



Construction of Shaft Station and Ore Pocket

are encountered, they are removed, and the laths are nailed in place against the wall plates. The drifts run in 16 ft. from the shaft, and when the raise is up on a level with their bottom, holes are knocked through. This raise is used as a chute while the station and pocket are being cut.

When the drifts are in 16 ft. from the outside of the shaft, sills are laid perpendicular to the wall plates and the ends butt against the studdles. The tops of the sills are made flush with the top of the wall plate and the sills wedged tight against the shaft.

The backs of the drifts are taken up to about 15 ft. to allow caps to be put in place. There are four 18-in. posts 11 ft. long put under each cap. The caps are 2 to 2½ ft. in diameter, and 10 ft. between the shoulders. The shoulders are cut in about 2 inches.

The posts next to the shaft are placed against the studdles, and those at the further end, are wedged in place. Each cap is also wedged against the shaft. To put the 20-ft. lagging in place (12-in. round timber), a cut is made about 2 ft. higher than the caps, and run in about 8 ft. from the shaft. Small poles are placed parallel to the caps with one end resting on the wall plate, and the other in a hitch cut for that purpose. These poles catch up the back while the lagging is being put in place.

The ore in the upper part of the station is sluffed off and a small drift is started to allow the 20-ft. lagging to be placed. Two thicknesses of boards are placed over the lagging with the joints broken, and the back is blocked up above the boards. The remainder of the upper part of the station is taken out, and the rest of the 20-ft. lagging is placed and boarded up. Poles are used as before to catch up the back, one end resting on the lagging already in place and the other in a hitch. This 20-ft. lagging, 8 or 10 pieces, is equally spaced and small blocks are used to keep them apart. The lower part of the station is then taken out, and a third sill is placed between the others at the ladderway divider. A "taking-up set" is placed on this sill.

The sills are 2-ft. timber hewed flat on two sides, and the "taking-up set" is 14x14-in. square timber. The pocket is then cut down next to the shaft, and posts are set under the sills and stand against the studdles. These posts are set in hitches about 2 ft. below where the bottom of the finished pocket will come.

The pocket is next cut back, and other posts are placed against the first under the sills. These posts are wedged tightly into place and a spreader or cross-sill 6x12 in. is placed between the 16-ft. sills, and against the wall plate to keep the 16-ft. sills apart. Another spreader 12x12 in. is placed at the other end of the 16-ft. sills and four more cross-sills are placed between. Two of these support the rails and are "let into" the 16-ft. sills. The four cross-sills are 16x16-in. square timber. The two wall plates in front of the station are cut off against the studdles, and raised up even with the caps. The pocket is lined with 3-in. plank and ⅜-in. sheet iron. Quarter-pans are placed in the skip-ways.

*Engineer, Oliver Iron Mining Co., Mesaba, Minn.

Safety Inspection at Cleveland-Cliffs Mines

One of the papers read at the meeting of the Lake Superior Mining Institute, at Houghton, Mich., dealt with safety inspection in mines. This was presented by William Connibear, of Ishpeming, head of the safety department of the Cleveland-Cliffs Iron Co. The subject was further emphasized at the meeting by remarks by Dr. J. A. Holmes, director of the Bureau of Mines, who urged cooperation of the mining companies in giving publicity to new methods of safety inspection and prevention of accidents.

Mr. Connibear described the methods used by the Cleveland-Cliffs Iron Co., which has had a safety department for 18 months. As one means of assisting its employees to exercise safety precautions, the company has published a book of rules, issued in two forms, one for superintendents and foremen, and one for all other employees. The first is printed in English, the second in English, Finnish and Italian. Every employee receives a book and signs a receipt agreeing to study and obey the rules. This agreement is filed in the central office of the company. Within a reasonable time he must satisfy his foreman that he is familiar with the rules of the company. The first violation of the rules may be sufficient cause for a suspension of six days or longer, and a second is usually followed by dismissal from the company's service.

The safety department is in charge of a safety inspector, whose duty it is to inspect all places where men are working or through which they are obliged to travel. His reports are submitted to the central office, where they are given careful attention. A proposed inspection of a mine is not announced and no opportunity is given the men in charge to make changes that may be necessary to meet the requirements of the rules.

In addition, safety inspections are made periodically by a committee of mine foremen, consisting of three members selected from different mines of the company. Each committee makes one inspection of all mines, and submits a report to the central office through the safety inspector, who accompanies them in capacity of secretary.

It is a trait of human nature that whenever rules and regulations are formulated, which affect a body of men as individuals and as a whole, a curiosity is evinced to know how the other fellow is obeying them. Thus it has been found that the foremen serving on the inspection committees have gladly accepted the opportunity, and have always been impressed by the fact that the safety rules, that they hitherto have known only in one mine, are but a part of a system in vogue at all the mines. They then conclude that the movement has come to stay and that it behooves each one individually to fall into line and keep up with the other fellow.

To win the confidence and coöperation of the workmen, there is a workers' safety committee, which operates similarly to the foremen's committee, except that each mine is inspected by a committee of its own workmen, while one foremen's committee makes an inspection of all mines. Workmen of different nationalities are chosen; it is interesting to observe the curiosity which fellow workmen exhibit when one of them is selected for the committee. The workmen's committee inspects all workings that might be dangerous, the handling of explosives, etc., and makes suggestions by a written report through the safety inspector.

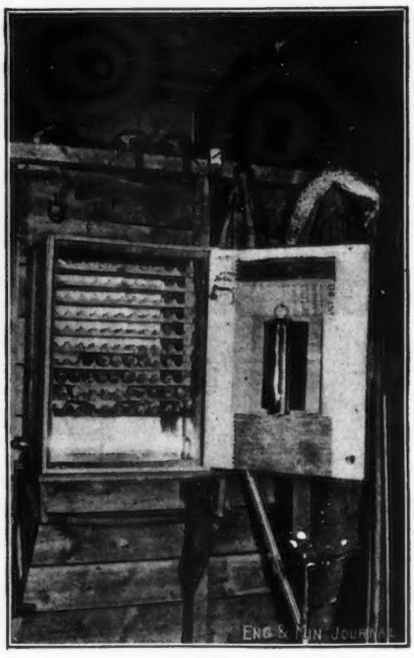
To legislate on recommendations of the foremen's and workmen's committees, there is a central safety committee composed of the company's mine superintendents of Marquette County, the head mining captain, the master mechanic, the assistant auditor, the secretary of the pension department, the safety inspector, and the agent or general superintendent.

In addition to the above precautionary measures, the company has established three mine-rescue stations, equipped with oxygen helmets, electric portable lamps, pulmotors, etc. A man is delegated to look after each station and train men at all mines assigned to his station. Employees familiar with the mine are chosen as members of the corps, such as foremen, timbermen and trackmen. Each corps is drilled at least once a month, and a record forwarded to the central office. Also, at each mine is maintained a corps of five men consisting of surface and underground workers, trained in first-aid-to-the-injured; drills are held each month, and demonstrations in which all teams participate are held as soon as the teams become proficient. Treatment of broken bones, electric shocks, drowning and gas fatalities are included.

Electric Powder Warmer

By J. N. Esselstyn*

An effective powder warmer can be constructed wherever electric lights are available, by using a zinc-lined fuse case, fitted with a suitable rack inside to hold the powder and having an air-tight door.



Electric Powder Warmer

Pieces of heavy cloth tacked about the edges of the door will help to make it air-tight. Close to the bottom of the case on each side are placed two 16-cp. incandescent lamps with the switch keys on the outside of the case. In the door is a small glass window and a thermometer hangs in the case in such a position as to be visible through the window. Sufficient space should be left between the lamps and the bottom of the rack to prevent overheating the powder nearest the lamps. The warmer shown in the accompanying photograph holds 100 sticks, 50 lb., of 1⅛-in. powder. Powder taken from the magazine at a temperature below 32° has been raised to a temperature of 90° in two hours. The thermometer is an important feature of the warmer, as one or both lights can be turned off as the temperature reaches the thawing point. By means of a mercury-cup contact, battery and magnet, the lights can be made to work automatically at any desired temperature.

*Mining engineer, Sugar Loaf, Colo.

Federal Cage and Skip

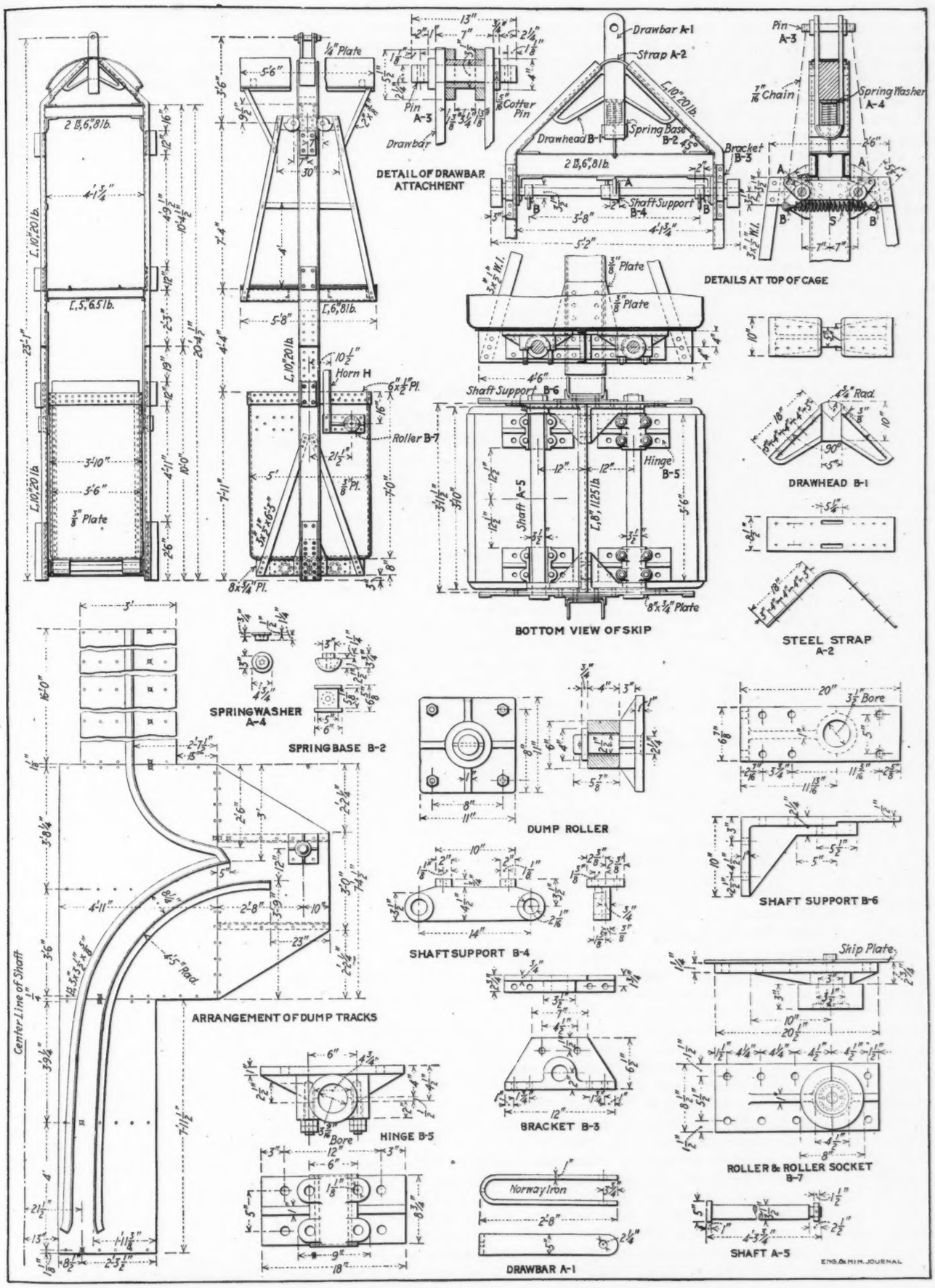
The accompanying drawings show the details of the cage and skip that are used at the No. 1 shaft of the Federal Land Co., in southwestern Missouri. There is a top deck which can accommodate a car and on which men can be handled while under it and from the same frame is swung the deck that carries the self-dumping skip. This skip holds 5.4 tons of ore.

There are several interesting features in the design. The shoes or runners, that follow the guides, are the channels that form the main members of the cage and skip frames. To these runner channels four shoe channels are riveted, which extend out farther on the guides, two on the frame that carries the skip, and two on the frame that carries the deck for the men and car. The two frames are bolted together by means of a splice plate as shown in the drawings. These main channels are bent over at the top and spliced together by strap *A*2, through which passes the drawbar *A*1. Under the two runner channels and bolted to them is the drawhead casting *B*1. This is contracted at the center so as to be straddled by the clevis-shaped drawbar *A*1, which comes down and straddles the shock spring and shock-spring base *B*2. The spring, of course, foots against the drawhead casting. This whole mechanism is inclosed by cover plates fastened to the channels. One plate is riveted while the other is fastened by bolts so that it can be easily removed. On the draw pin *A*3 is a sleeve over which fits the clevis by which the cage-and-skip frame is fastened to the rope shackle.

The chains leading down to the safety-dog levers fasten to eye-bolts, through which the pin *A*3 passes. The safety dogs, which are toothed castings, are held together by the spring *S*, which connects with the two lever arms *B*, which in turn are keyed to the dog shaft. The safety dogs are held away from the guides by the pull on the drawbar, which is transmitted to them by the chains connecting with the levers *A*, which are also keyed to the dog shafts. The rest of the cage follows the ordinary lines of construction.

On the lower platform of the cage, it will be noticed that there are two pivot shafts for fastening the skip body to the frame. This is to allow the skip to dump in either direction. Formerly it discharged into a pocket on the opposite side of the shaft from that now in use.

A peculiarity of the skip is the use of horns *H* to right it after dumping. The tripping is accomplished by the skip rollers following out on a double runway, as can be seen in the drawing



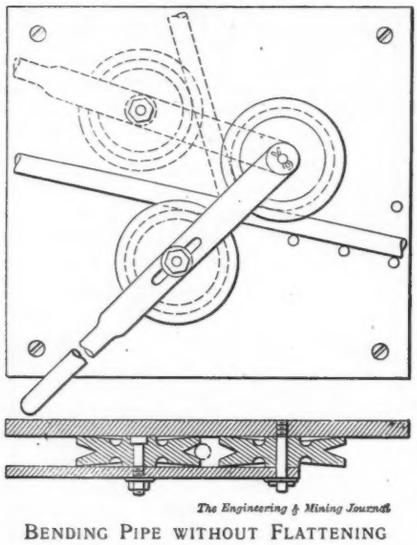
CAGE AND SKIP AT NO. 1 SHAFT OF FEDERAL LEAD CO. IN SOUTHEASTERN MISSOURI

of the dump, the upper runway, however, has only the bottom track. On coming down after dumping the skip rollers run forward, following the guide runners until at the point of the dump tracks, the horns engage with the nose rollers of the dump, and the body of the skip is given a push upward, bringing it back into an upright position on the skip frame. This same dumping arrangement is extensively used at the iron mines in the vicinity of Ishpeming, Mich. The other features of the skip do not need mentioning, as they follow the ordinary lines.

Device for Bending Pipe

For bending pipe without flattening it, the device here shown is suggested by a correspondent of *Engineer*.

The wheels are made of cast steel and bear on the pipe top and bottom, thus keeping it from flattening. By this means



BENDING PIPE WITHOUT FLATTENING

1-in. pipe has been bent to a radius of 5 in., and by a little practice it is possible to bend ½- to 1½-in. pipe to almost any shape.

Settling Pond Arrangement

As it is frequently necessary to use surplus mine water in the boilers, care must be taken to remove any sediment in order to reduce the quantity of scale. The most common method of accomplishing this is by the use of settling ponds.

In order to diminish the accumulation of slime in the pond as much as possible the overflow should be near the point of inflow. A current is then developed which tends to remove any excess water before it has had time to deposit much of its suspended sediment in the pond. The supply for the boiler should, of course, be drawn from a point as far distant as possible from the inflow.

At the No. 6 shaft of the Desloge Consolidated Lead Co. in southeastern Missouri, a three-sided concrete well is provided for cleaning out the pond. In the bottom of the well is a large drain pipe which is always left open. The open side of the well faces the pond and is closed by means of two-inch planks. These planks are arranged at such a height that any excess water entering the pond overflows across their top, down into the well and is then discharged through the open drain pipe.

In cleaning the pond the planks are all removed and the water from the pond is allowed to rush into the well and out through the open drain pipe. It is found that most of the slimes in the pond are carried out along with the water. With the use of such a well having an open discharge or drain pipe no valves are necessary. When an ordinary discharge pipe fitted with a valve is used, slime frequently accumulates in front of and around the valve, plugging it and rendering its operation difficult.

Starting a Long Idle Plant

It frequently happens that engineers are called upon to reopen mine plants that have been idle for a considerable period. The following simple and obvious precautions, described in *Power*, should be taken before starting the power plant:

Make hammer test and if necessary renew all defective boiler connections in each instance back to the first stop valve, and see that try-cocks and water-column connections are clean of any scale or sediment and all stop, check and safety valves are in good working order. Have the steam gage tested. Clean out furnaces and back connections and remove all soot from smoke uptakes and flues and from the base of the chimney. Make internal and external inspections of boilers and settings. Examine water supply and overhaul feed pumps and injectors. Examine whether blowoff connections are open to their place of discharge. After boiler and connections are cleaned and put in safe working order, fill boiler and with a slow wood fire examine setting and stop any air leaks and repair them. Then slowly getting up steam, note any leaks and repair them, but not while under pressure. Make a light hammer test of heater and connections.

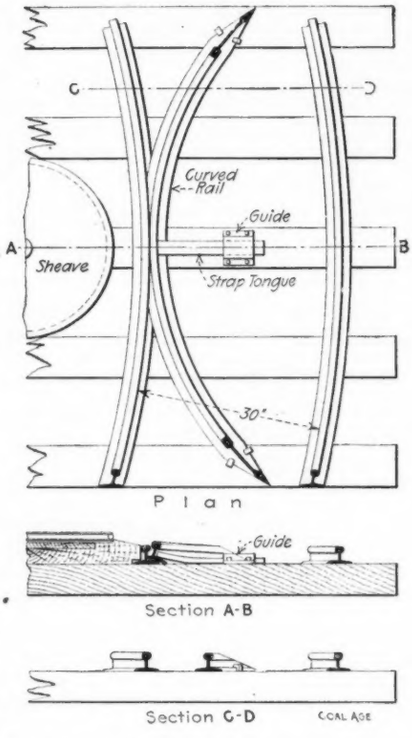
Remove engine-cylinder head, clean out grit and dirt from all steam passages by blowing steam through them and have cylinder perfectly clean before replacing the head. Repack stuffing-boxes and inspect valve setting and all governor connections.

Trace out all engine connections and examine valve setting. Uncover and clean all bearings and flush them with clean thin oil. In starting the engine, use plenty of lubricant. Before putting steam in the engine follow up all transmission connections to see that they are in safe running order, and in starting up run slow and have the load laid on gradually.

Guiding Ropes on Curves

A rope incline which contains many curves sometimes occasions trouble by the rope catching under the rail head, when rounding the curve, and thus being thrown off the sheave. Joseph Daniels proposes an ingenious method of avoiding this trouble in *Coal Age*, Aug. 24, 1912. It is as follows:

A section of rail, usual weight 30 lb., has its ends tapered to a wedge and is bent into a curve having a middle ordinate of 5 in. in a chord of 6 ft. This rail is placed so that its center touches the main rail at one point and its ends are then spiked to the ties, leaving this mid-



SKETCH OF GUIDE ARRANGEMENT FOR USE ON CURVES

dle point free to move. A piece of strap iron is fastened to the rail flange at the middle point and slides in a guide which is also spiked to the tie as shown.

The action of this arrangement is as follows: The cars going up or down the incline spring the curved rail away from the point of contact, thus permitting the trip to pass and immediately spring back to place after the last wheel flange has passed.

The rope at this time is approximately in the middle of the track, but its tendency will be to side over toward the short chord of the adjacent curve. In doing so it is carried from the middle of the track over the wedge point of the curved rail past the main rail to the sheave. In this way the rope is prevented from getting underneath the head of the main-track rail.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

A Cheaply Made Dewatering Wheel

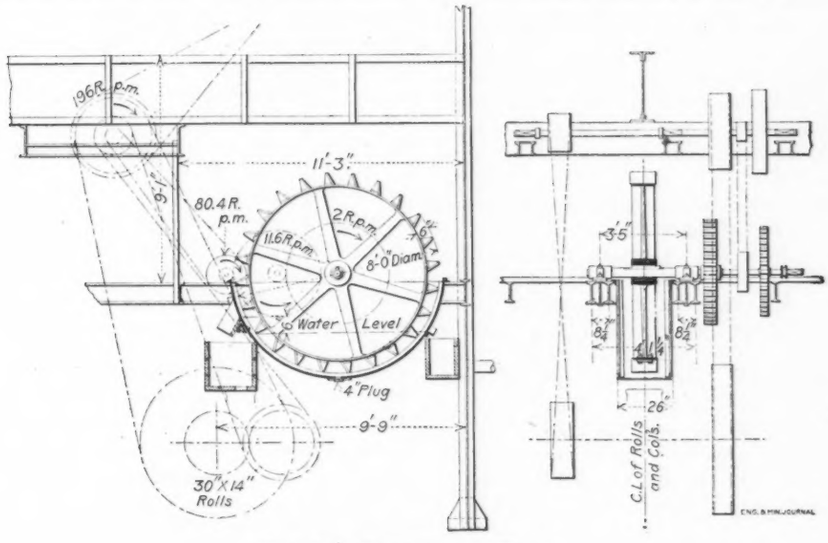
BY CLAUDE T. RICE

The dewatering wheel, which has recently found favor in the milling practice of this country is said to be an old German device. One of the first used in the United States was installed at the Daly-Judge mill, Park City, Utah, by the late J. B. Fleming. This wheel was not over four feet in diameter at the tips of the blades, which were curved away from the direction of rotation so that the action was shoving rather than scooping.

The design was somewhat modified by David Cole, of the Greene Consolidated Copper Co., at Cananea, for dewatering the pulp fed to regrinding rolls, and a wheel resulted with its diameter at an angle of 45° to the horizontal and with its blades curved toward the direction of rotation. Wheels of this or similar design are used by the U. S. Smelting Co., at Midvale, Utah, for dewatering jig tailings before regrinding in tube mills; by George Waddell, of the Nevada Consolidated Copper Co., for dewatering the feed of the fine-grinding rolls at the Steptoe mill and by G. A. Overstrom in a Flat River, Mo., mill for dewatering jig tailings before crushing in rolls. Allis-Chalmers have also put this wheel on the market.

In the Cole dewatering wheel the distance that the pulp is scraped and the time that it is given to drain is so small that there is trouble in obtaining a dry product. Moreover, on account of the wheel being placed somewhat on its side, too much floor space would be required if its capacity were increased greatly.

For the last three years the dewatering wheel has been used in the lead district of southeastern Missouri for dewatering tailings before they are stacked by the belt conveyors. Large capacities are therefore required and there are some points in the design that warrant a brief description. The wheels were introduced by O. M. Bilharz, the general manager of the Doe Run Lead Co., at the new mill at Elvins, Mo., and they have since been adopted at the mill of the Federal Lead Co. Mr. Bilharz returned to the old German idea of a vertical wheel and backward sloping blades that lift the pulp up along a semicircular bottom. In this way a machine capable of handling up to 1500 tons a day was obtained.



DOE RUN DEWATERING WHEEL

Dewatering wheels are cheaply made and their upkeep is small. An accompanying drawing shows the driving pulley of an old set of rolls converted into a dewatering wheel for feeding middling rolls at the plant of the Doe Run company.

This driving wheel is seven feet in diameter, and has a face 10½ in. wide, to which a series of shovel blades were fastened. The blades have a slight pitch backward so that they scrape instead of shovel the coarse particles out of the box. In order to facilitate draining the water from the coarse sands, the shovel plates are perforated. The front of the blade is straight across and is not scoop-shaped as are those on the main tailings wheels. The blades are cast with a flange by which they are bolted to the rim of the old driving pulley and are reinforced by a raised rib on the back.

The box in which the wheel rotates is made so that the dewatered product is discharged about six inches above the overflow; the feed comes in at the side. The box as seen is made with a rounded bottom. A narrow box with a flat bottom would probably be better, as the coarse material would build up its own floor, and in case a shoe should break or work off it would be less liable to break other shoes than when it is wedged against an unyielding bottom. Moreover, such construction would be cheaper in first cost and in maintenance. Any of the product that is too large to be kept in suspension is shoved ahead, on the bottom of the tank by the rotating blades, carried up the side of the tank and discharged over the lip at the other end. In this way the coarser particles are washed free from the finer grains, and a fairly coarse, dewatered product is obtained. The fines that come to the dewatering wheel are kept well churned up, and the overflow must be treated by some other device. The shovel wheel is only intended for handling coarser sizes of pulp. The shoes are 12 in. wide and extend out from the rim six inches in a roughly radial direction. They are cast about one inch thick with their blades about ¾ in. thick. In case half of a blade is cracked off, as occasionally happens, a piece of iron plate can be bolted to the remnant and the scraper blade made practically as good as new.

Altering Blueprints

BY CLARENCE M. HAIGHT*

There are many operations which require uptodate blueprints at frequent intervals. In many cases the major part of the print remains unchanged; yet after one or two erasures, the tracing will have to be duplicated on account of wear. By using a tracing partly in ink and partly in pencil, much more service may be obtained from one tracing than if it had been drawn entirely in ink.

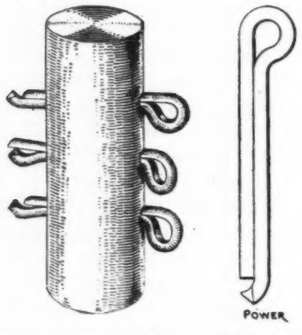
All the details which will remain unchanged are drawn in ink on the shiny side of the tracing cloth. Those details that are of a changing nature are drawn

*Mining engineer, Hibbing, Minn.

with a soft pencil on the rough side. On one side the drawing will have to be reversed as in a mirror. Which side to choose for this reversing will, of course, depend on the nature of the work. Printing backward is perhaps more difficult than any other part of the work and so the printing may determine this choice. A convenient way to make this reversed work is to draw it correctly on another sheet of tracing cloth, then turn the drawing over and place the original tracing on this, also turned over, and trace the work. A glass topped drawing table will be found convenient for this. While the pencil work will not print as clearly as the inked portions, it will be clear enough for most purposes. The great value of this method is in the saving of time which it accomplishes through not having to duplicate tracings.

The Campbell Cotter Pin

To obviate the bother of spreading the tips of a cotter pin after inserting and the usual trouble incident to its removal, an improved design has been patented



OPERATION OF CAMPBELL COTTER PIN

by Andrew C. Campbell, of Waterbury, Conn. (*Power*, Sept. 10, 1912).

The pin, as shown, is made from a piece of half-round wire, bent so as to provide an offset eye at one end and have two limbs of unequal length with the flat sides adjacent. The tip of the longer limb is bent at an angle across the tip of the shorter limb. Hence, when the eye is given a blow, the shorter limb is driven over the longer one, and the engagement of the tips causes a separation of the limbs.

To remove the pin a screw driver or other tool having a sharp flat end, such as the tang of a file, is inserted in the eye, and by twisting it so as to expand the flattened eye, the short limb of the pin is drawn back to its original position and the pin may be withdrawn easily.

The top pin in the illustration is merely inserted in the hole; the middle one has its limbs spread by a blow on the eye; and the bottom pin is about to be extracted.

The entering point being on one limb only, this pin is easier to insert in the hole than an ordinary cotter pin. Moreover, the latter must be spread on the side of the hole opposite from that in which it is inserted, while this new pin is inserted, locked and removed from the same side, making its use possible in places difficult of access.

Troublesome Battery Shoes

BY LYON SMITH*

Frequently in a large stamp mill a shoe becomes detached from a boss head and for a few minutes is not detected by the man on shift. The shoe may lodge in the mortar box in such a manner that the boss head drops on the shank of the shoe, tending to form a projecting ring on the inside of the opening into which the shoe fits. This is especially true when the shank of the shoe comes in contact with the inside periphery of the boss head, and is more likely to happen if the shoe is new and correspondingly heavy; for an old and lighter one would in most cases soon become dislodged from such a position.

Often it is impossible to drive the shoe on again as the projecting ring of metal tends to cut the wedges to pieces. If the shoe is picked up in an attempt to drive it on, it is generally but a few hours before it becomes dislodged again. Shooting the boss head from the stem and substituting a new one may be resorted to, but the usual practice is to chip out the boss head. This is an awkward job and necessitates hanging up the battery from two to three hours.

A good way to obviate this prolonged hangup is to open the mortar box, remove the detached shoe and substitute an old and lighter shoe, decreasing the height of drop of this particular stem to about four inches, slightly less than the length of the shank of the shoe. Wooden wedges should not be used in driving on this shoe as a metal-to-metal contact is desired. The mortar box should then be closed and the five stems dropped as usual.

The battery should be run a few hours, taking care to feed closely, when it should be hung up and the old shoe driven off. By this procedure the projecting ring of metal will be almost or entirely removed, and the new shoe can then be driven on in the usual way.

Sodium vs. Potassium Cyanides

The Roessler & Hasslacher Chemical Co. is calling attention to the various grades of cyanide it now puts on the market, and makes some calculation on their relative efficiencies. The results will doubtless be of interest to cyanide operators:

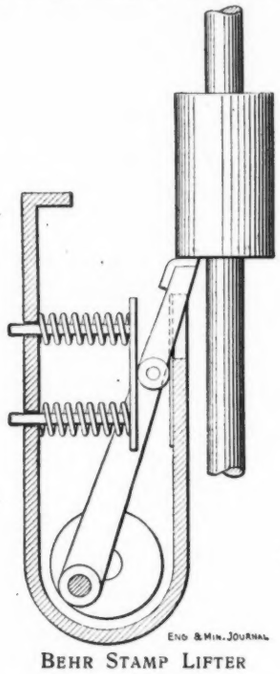
Compound	Commercial Name	CN %	Price c. per lb.	Cost of CN, c. per lb.
Sodium cyanide....	129%	52	...	51.25
Sodium cyanide....	100%	40	20½	51.25
Mixed cyanides....	98–99	39.5	21	53.16
Potass. cyanide....	95–96	38.4	24	62.50

*Blair, Nev.

The sodium cyanide is packed in 100- and 200-lb. cases. There is, of course, a freight saving on the higher grades also.

Stamp Lifting Device

Hans Charles Behr, of Johannesburg, South Africa, has patented (U. S. pat. 1,012,187) a means of lifting stamps in which the lifting itself is done by a dog driven by a shaft, instead of by the usual method of a cam mounted directly on the shaft. Suitable means of release are provided by which the dog is



BEHR STAMP LIFTER

withdrawn to allow the stamp to fall. There are several mechanical variations of the idea, one of which is shown in the accompanying illustration.

Relieving Cyanide Sores

The irritation from cyanide sores on the skin, says *Foundry*, October, 1912, can be relieved by applying camphorated oil. Add 3 oz. of camphor to 1 pint of olive oil and dissolve by slow heat. It occasions some pain when first applied but will soon afford relief. In mild cases the following will be beneficial: Zinc oxide, ½ oz.; zinc carbonate, 30 grains; glycerin, ½ oz.; lime water to make ½ pint.

For sores which do not heal use: Pure lard, 5 oz.; olive oil, 5 oz.; white wax, 2½ oz.; spermaceti, 2½ oz.; powdered gum benzoin, ½ ounce.

A desirable solution for rendering textiles fireproof is stated by *Le Mois Scientifique* to be : Alum, 60 parts; borax, 20; sodium tungstate, 10; water, 1000 parts. Sodium tungstate is also sometimes recommended to make baghouse bags resistant to acid fumes.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Some New Phosphides

Pierre Jollibois describes the preparation of some new phosphides of tin, nickel and zinc (*Proc.* Inter. Assoc. for Testing Materials, Vol. 2, No. 10). The phosphides of tin were prepared by fusing red phosphorus and pure tin in tubes of Jena glass, which had been evacuated. The compound produced, Sn_4P_3, was isolated by connecting the product as anode in a concentrated solution of sodium sulphide, to which had been added 5% of its weight in sulphur. The tin dissolves, the phosphide remains unchanged, and corresponds to the formula Sn_4P_3.

If a phosphor-tin containing over 16% of phosphorus be treated alternately with concentrated hydrochloric acid and with potassium hydrate, a product SnP_3 is obtained. These phosphides are attacked readily by halogens, and with hot caustic solutions give PH_3. SnP_3 is pyrophoric.

If an alloy of 5% Ni and 95% Sn is phosphorized as above, in Jena glass, using such an amount of phosphorus that there is an excess of tin, and then the product treated with concentrated hydrochloric acid, NiP_2 remains. If the phosphorus be increased until there is no excess of tin, we have

$$3\,Ni + 4\,SnP_3 = 3\,NiP_3 + Sn_4P_3$$

The ingot contains NiP_3, Sn_4P_3 and an excess of SnP_3. The SnP_3 is dissolved out in concentrated hydrochloric acid, and the residue is heated to 360° C. *in vacuo*. This transforms the Sn_4P_3 to SnP_3 and tin. These are then leached out with hydrochloric acid, leaving NiP_3 behind.

The compound Zn_3P_2, already known but not isolated, can be prepared by pouring fused zinc on red phosphorus, and separating the excess of zinc by volatilization *in vacuo*, or dissolving the zinc in fuming nitric acid at 0° C., which dissolves the phosphide less energetically than the pure metal.

Vanadium and Uranium Extraction

In discussing the processes of vanadium and uranium extraction from carnotite ores, Siegfried Fischer says (*Met. and Chem. Eng.*, August, 1912), that acid processes are unsatisfactory because the precipitated metallic vanadates are gelatinous and almost impossible to wash clean. In the extraction of the metals by alkaline solutions, the cost will be prohibitive, owing to reactions between the alkali and the silica gangue. If, however, the ore can be concentrated first, the vanadium and uranium may be extracted almost quantitatively, and the consumption of alkali, when referred back to the original ore, is not heavy.

The concentrate is mixed with the alkali-leaching solution to a pasty consistency, then evaporated to dryness, finishing at a temperature of 200° to 300° C. It may be necessary to repeat this process to get a high extraction. The mass is then extracted in a steam-jacketed stirring tank, the solution neutralized with sulphuric acid, and the vanadium precipitated as ferrous vanadate. The residue is then available for uranium extraction.

Alumina from Clay, Childs' Process

David H. Childs, of Alfred, N. Y., has patented a process (U. S. pat. 1,036,454) for the production of alumina from aluminum silicates, by volatilization of the silicon as silicon tetrafluoride. Approximately four pounds of aluminum fluoride are required for each pound of silica present. The finely powdered substances are mixed, for example, aluminum fluoride and kaolin, and heated in a suitable oil or gas furnace, to a temperature of from 1600° to 1800° F. The temperature must not exceed 2500° F. and lies well before the fusion temperature of the mixture. The reaction is facilitated by adding water by means of a steam jet during heating. The silicon is driven off as silicon tetrafluoride, and if a pure aluminum silicate (such as kaolin) has been used, a pure alumina is left behind.

The aluminum fluoride is prepared (U. S. pat. No. 1,036,453) by conducting silicon tetrafluoride over a compound of aluminum, preferably kaolin, which is kept moist by a steady flow of water. The water takes up the gas.

$$SiF_4 + 4H_2O = SiO_2.2H_2O + 4HF$$
$$2SiF_4 + 4H_2O = H_2SiF_6 + SiO_2.2H_2O + 2HF$$

The acids thus formed attack the compounds of alumina present. For instance, if kaolin is used, the equations are as follows:

$$6HF + Al_2O_3.2SiO_2 = Al_2F_6 + 2SiO_2 + 3H_2O$$
$$H_2SiF_6 + Al_2O_3.2SiO_2 = Al_2F_6 + 3SiO_2 + H_2O$$

Eventually a strong solution of aluminum fluoride is formed, which can be drawn off, evaporated, and crystallized. The aluminum fluoride thus obtained can either be used by heating with kaolin, or can be calcined to produce alumina.

$$Al_2F_6 + 3H_2O = Al_2O_3 + 6HF$$

It should be noted that hydrofluoric-acid gas can be used in the same way that silicon tetrafluoride is used, for the production of aluminum fluoride from kaolin.

Liquefied Products from Natural Gas

Natural gas may be divided into two great classes, a so called "dry" gas, the natural gas of commerce, and a gas containing many easily liquefiable vapors, known in the vicinity of the oil fields as "wet" gas, say I. C. Allen and G. A. Burrell (*Tech. Paper*, No. 10, Bureau of Mines). The latter class forms the basis for the "natural gasoline" industry.

By fractionating natural gas, during or after liquefaction, four products may be obtained: The natural gas of commerce; a semi-liquid, known as the new "wild" product, which should be used only as a liquefied gas and held in steel containers; a light liquid, for blending with heavy naphthas; and ordinary high-grade gasoline.

As early as 1904, commercial gasoline was procured near Titusville, Penn., by Pasenmeyer, by collecting the condensation in gas mains. The yield was increased in 1905 by chilling the pipes with cold water, and still later by using small compressor plants. The general practice was to obtain a liquid product by compression in single-stage compressors operated at 150 to 300 lb. per sq.in. This liquid was then run into open tanks and "weathered," i.e., the lighter portions allowed to volatilize spontaneously and escape until the boiling away had ceased, which process involved an absolute waste of 25 to 50% of both the product and the labor of obtaining it.

The next step was to give the gases from the first compressor a higher degree of compression, getting a "wilder" gasoline, which was run back and mixed with the first liquid. The mixture was then exposed to the wasteful "weathering. Recently, however, the second-stage gasoline has been kept separate and used to enrich heavy refinery naphthas.

However, the authors believe that it has been a great mistake in the gas-gasoline industry not to recognize the gaseous nature of the product and handle the product in steel containers just as other commercial liquid gases are handled. The gasoline obtained by them working at 400

lb. pressure and artificial cooling, developed a vapor-tension of 755 lb. per sq.in. at 133° F., which shows that handling such products even at high summer temperatures is not impossible. Such gasolines consist mainly of ethane, with a little propane and butane, and still less of the higher hydrocarbons.

The liquefied gas was used for heating, in internal-combustion engines, and for illumination, and was satisfactory for all purposes, although in the last field it is not satisfactory for direct burning with lava tips.

Melting Points of Salts

The melting points of various salts is of great interest to the metallurgist and chemist, so that we reprint the following table from the *Brass World*, which compiled it from "Carnelly's Table of Melting Points."

Substance	Melting Point Deg. C.
Barium Fluoride	1000
Calcium Fluoride (Fluorspar)	1000
Potassium Fluoride	790
Lithium Fluoride	801
Magnesium Fluoride	908
Sodium Fluoride	902
Strontium Fluoride	734
Silver Chloride	451
Aluminum Chloride	180
Barium Chloride	860
Calcium Chloride	720
Cuprous Chloride	434
Cupric Chloride	498
Ferric Chloride (Iron Perchloride)	300
Potassium Chloride	730
Lithium Chloride	600
Magnesium Chloride	708
Sodium Chloride (Common Salt)	770
Lead Chloride	500
Strontium Chloride	825
Zinc Chloride	262
Boron Trioxide (Boric Acid)	570
Sodium Nitrate	300
Potassium Nitrate	340
Potassium Carbonate	830
Sodium Carbonate	814
Lithium Carbonate	695

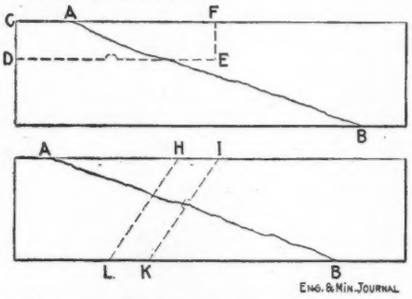
In connection with the melting points of substances, it should be understood that a mixture of two salts usually melts at a lower temperature than either. For example, a mixture of potassium carbonate and sodium carbonate melts at a lower temperature than either of the salts, and as a rule the lowest melting mixture of two substances is when they are in equimolecular proportions.

Boronized Cast Copper

In discussing the use of boron for making copper castings of high conductivity, before the American Institute of Metals, Dr. E. Weintraub states that boron suboxide is produced by reducing boric anhydride with magnesium, aluminum, or an alkali metal, and purifying the product chemically. However, for copper castings it is unnecessary to purify the product. Of the reduced mixture, known as boron-suboxide flux, about 0.75 to 1.0% of the weight of the copper must be added, equivalent to about 0.08 to 0.1% of boron suboxide. Any mixture containing boron in the reduced state will do in this work, e.g., carbide of boron, or any mixture of carbon and boron. While the electrical conductivity obtained may be as high as 97%, Mathiessen standard, ordinarily it is unsafe to guarantee over 90%. The mechanical properties of a typical sample are given as follows: Tensile strength, 24,350 kg. per sq.in.; elastic limit, 11,450 kg. per sq.in.; elongation, 48.5%; reduction in area, 74.49 per cent.

Strength of Welds

That the apparent strength of welds under ordinary tests, and their numerous failures under working conditions, is due to taking the sample to be tested in an incorrect manner is urged by C. Fremont ("New Method of Testing Welds," *Proc.* International Association for Testing Materials, June 28, 1912). That is, if the line *AB* be the approximate weld, a test piece is ordinarily cut out as shown by lines *CDEF*. If, however, a nicked test piece be cut out as shown by the lines *HIKL*, and submitted to impact test, the weld usually cleaves open under a slight blow, and exhibits only 2 or 3% the strength of the plate.



BAD AND GOOD METHODS OF TESTING WELDS

His conclusions are: The static strength obtained in testing forged scarf-jointed welds is equal to the static strength of the metal only when the welded surface is sufficiently large to compensate for the lower elementary strength per unit surface, just as in a brazed joint. Autogeneous welds are weaker than forged welds. Forged welds (even when successful, of which there is no proof in practice) are always weaker than the metal, the weld being merely a more or less perfect adhesion only, which explains the number of weld fractures in service. Hence welding should not be allowed, unless the accidental fracture of the article will not be dangerous.

Treatment of Nickel-Copper Mattes

A wet process of treating nickel-copper mattes that have been blown free of iron, is patented by McKechnie and Beasley (Brit. pat. 15,850, of July 8, 1911). They are heated with sulphuric acid in a closed vessel to a temperature exceeding 100° C., at a high pressure. The nickel sulphide is dissolved and the liberated hydrogen sulphide, under the high pressure which prevails, precipitates any copper which has also gone into solution. There thus results a solution containing all the nickel, and free from copper. It is preferable to roast the matte slightly before treatment with acid, in order to increase its porosity. If, however, such roasting leaves insufficient nickel sulphide to cause the precipitation of all the copper which is also dissolved, additional matte, preferably unroasted, may be introduced in order to make good the deficiency.

Vertical Copper Converters

For many years, there has been considerable difference of opinion among metallurgists as to the relative advantages of the barrel and vertical types of copper converters, says the *Salt Lake Mining Review*. The barrel type has perhaps been in more general use, the Boston & Montana plant of the Anaconda Copper Mining Co., at Great Falls, Mont., being almost the sole representative of the vertical type. The size of converters at this plant has been steadily increased, and most comprehensive experiments have been carried out. Finally a large type has been perfected, which is being rapidly adopted, and seems to be the most economical. The Greene-Cananea Consolidated Mining Co. has installed one at Cananea, Mexico; the Calumet & Arizona Mining Co. will install five in its plant at Douglas, Ariz.; and the Copper Queen, three. The smeltery of the Arizona Copper Co., at Clifton, Ariz., will have three, and the United Verde, at Jerome, expects to install some. The Arizona smelteries will use the size which is 19 ft. high and 12 ft. in diameter. The latest practice at Great Falls favors even larger sizes.

Removal of Phosphorus from Iron

Discussing the removal of phosphorus from iron, before the International Congress of Applied Chemistry, A. E. Greene laid great stress on the importance of temperature control. Thus under 1450° C. the phosphorus in pig iron has more affinity for oxygen than has the carbon in the pig iron, but it has less than solid carbon. Over 1450° C., phosphorus has less affinity for oxygen than has the carbon in the pig, and calcium phosphate is slowly reduced. Silicon will decompose $Ca_3(PO_4)_2$ at all working temperatures, forming calcium silicate and setting free phosphorus. As to the oxide of iron in the slag, solid carbon forms a more efficient reducing agent than does the carbon in the bath. However, by complete control of reducing and temperature conditions it seems possible to eliminate phosphorus from the iron, and iron from the slag.

Native Placer Mining in Colombia

By R. D. O. Johnson*

Native placer mining in Colombia is carried on in river beds which can be worked only in the dry seasons. Tops of shifting bars are washed in bateas. Artificial bars are formed, pits are sunk and parts of the river beds are cut off by crude wing dams in order to make the gravel on bedrock available for washing.

*Mining engineer, Apartado 110, Medellin, Colombia.

The equipment of the native placer miner in Colombia is secured from the forest or jungle adjacent to his operations. Beyond the ubiquitous machete he needs no assistance in the way of tools from the outside world.

A knowledge of the tools, devices and methods evolved out of the necessities of the isolated native's way, well serves the needs of the prospector or miner who finds himself far from his base of supplies and with no means at hand for drawing upon a stock of modern appliances. Moreover, it is not unfrequently found that the native tools and appliances are better adapted to the work for which they were developed than any that are listed in the catalogs of mining-supply houses. Upon his advent into this country, the American prospector discards the gold pans he has brought in his kit for the *batea,* and falls as naturally into the use of the *almocafre* (Fig. 5), as though he were born to it. This instrument, which originated with the aborigines in prehistoric times, combines the virtues of the pick and hoe without the faults of either and with many virtues of its own.

Spaniards Exhausted High-bench Gravels

It is probable that before the advent of the Spaniards into South America, the placer-mining operations of the aborigines were confined to the washing of the *aventaderos,* or high bench gravel that could be made to yield their gold by the employment of simple methods, such as ground sluicing. The adventurous and energetic Spaniards promptly turned their attention to whatever was left of these easily worked deposits, the product of which for many years kept filled the coffers of Spain. The exhaustion of these deposits led to the working of other but less favorably situated ground, until today there remains the rich river beds and the water-filled playas, or river bottoms, which latter have baffled the best efforts of the Spaniards and their home-made apparatus.

The river beds can only be worked during long continued dry seasons. A few tropical downpours puts a stop to native river mining. The gravel in the beds of many of these rivers is rich, estimated in some cases at from $4 to $10 per cu.yd. That these gravels are rich is evident from the yield, considering the primitive methods employed in their working and the small quantities actually washed.

Women Expert Operators

When the dry season is well advanced and the waters of the rivers have fallen to a low point, the peons and their women flock to the river sides. They proceed to construct rude shelters with palm-leaf roofs and to "camp on the job." At such times the supply of labor for mining and agricultural purposes runs low, and wages must be raised to match the lure of the river.

The women as well as the men are expert operators with the *batea.* The women generally work independently of the men, employing in their washing operations the large spoon *batea* with the handle, as shown in Fig. 1. These *bateas* seem not to be made to any standard dimensions, the bowls varying in length from 3 ft. to 6 in., in width from 20 to 28 in. and in depth from 4 to 6 in. Handles are from 12 to 14 in. in length. Like all other *bateas,* these are cut from the solid wood, some artisans acquiring great reputations for their skill in making them. Armed with these huge *bateas,* the women wade out into the river, usually selecting as the place for the operation a point at the up-stream end of a bar or a raise in the river bed, such a point being thought the most favorably situated for the deposition or concentrating of the moving gold. It is not an unusual sight to see from six to a dozen women in a line across the central part of a gold-bearing river up to their waists or arm-pits scooping up the gravel from the bottom with these great wooden bowls.

Gravel Washed Down to Black Sand

The *batea* is employed as a shovel in digging up gravels, the convex side being invariably turned up-stream. In washing the gravels, the *batea* is floated on the water surface and given a peculiar rocking, swashing movement that rapidly and effectively concentrates the charge to the black-sand contents. The movement allows water to enter the bowl over one edge, and after having completed the circuit, to escape near the point of entrance, washing overboard the lighter parts of the charge. The washing is completed, so far as this operation is concerned, when black sand only remains. This is washed into a small gourd (Fig. 2), that is fastened to the waist by a string and held in front.

At the end of the day the contents of the gourd are cut down in a small *batea* of the pattern as shown in Fig. 3. The gold obtained by this washing process is fine, the gravel treated being taken from the tops of shifting bars. The quantity actually handled per day probably does not exceed seven or eight cubic feet. The returns vary from 20c. to $2 per day, depending upon the locality. When it is considered that the prevailing wage for women is from 10 to 15c. per day, the return of the washing operations are properly regarded as magnificent.

Natives Form Artificial Bars

A somewhat more ambitious method of treating the river gravels and getting at those lying on bedrock, is known as the *sombre* method. This is generally undertaken by the men, two, four or more working together. A line of eight or 10 stout stakes, spaced from 18 to 24 in. apart, are driven at the point selected, the direction of the line being at right angles to the direction of the river current. The stakes are from eight to 10 ft. in length and are driven through the bed of sand and gravel into the decomposed granite bedrock. The stakes are braced on the downstream side by inclined stakes. These are bound to the vertical stakes by *bejucos,* a kind of stout though soft and flexible vine. The vertical stakes stand above the water about 18 in., and on each side of these stakes near the top a horizontal pole is bound. These two poles serve as a platform from which the shovelers work. In a vertical position on the up-stream side of the vertical poles, is placed a mat made of palm leaves. This mat is adjusted in position so that its lower edge stands but a short distance above the top of the bed of sand and fine gravel that usually overlies the coarser and more compacted stratum of gravel on bedrock. The sweep of the water underneath the mat carries off the lighter sand and gravel and piles them up in the more quiescent water below the *sombre,* as the poles and mat are collectively called. The women are always anxious to wash these artificially formed bars. When a sufficient amount of coarser gravel has been uncovered, the mat is moved down to obstruct the flow of water as much as possible and shoveling commences. The shovels are provided with handles 10 or 12 ft. in length. Not infrequently the natives employ in the place of shovels a kind of wooden scoop provided with a long handle.

Bedrock Not Thoroughly Cleaned

The amount of gravel that can be raised by two or three shovels is washed in a large *batea* (Fig. 1). Sometimes six shovelers and two washers may be seen

working at one *sombre*. Usually the gangs consist of three or four men. This method yields much higher returns for the labor than simply washing the upper stratum of sand and gravel. The shovelers frequently, though not always, reach bedrock, but it is impossible for it to be thoroughly cleaned by this method. Only a narrow strip of gravel, perhaps two or three feet in width, is uncovered by the water flowing under the mat and made available for shoveling. So energetically has this kind of mining been pursued in some rivers that the water flows through forests of stakes.

The method of driving the stakes is unique. The stakes are green hardwood and would split and be rendered useless long before they had penetrated the bedrock if driven by a maul or sledge hammer of usual pattern. Since iron rings or ferrules are unavailable or unknown, the natives devised a scheme of their own that is entirely satisfactory. The stakes are pointed at both ends, the upper end being rather blunt. The maul (Fig. 4) is made of tough, gnarly wood and is provided with a conical pocket into which the end of the stake fits. In driving, the blunt pointed end of the stake enters the conical pocket, the effect being to drive the fibers of the wood together and thus to prevent splitting.

Pits Sunk during Dry Season

During long continued droughts, many of the lower river bars are exposed. These exposed bars are favorite places for the carrying out of another class of river mining. In these are sunk pits 12 to 14 ft. sq., they are first excavated to a depth of one foot and a frame of heavy round timbers is put in. Outside of this frame stakes are driven separated by spaces of three or four inches. Excavation then proceeds, the gravel and sand being carried out in hand barrows.

As the stakes are exposed, the long grass-like leaves of the *caña brava* are laced in behind, presenting a tight and effective screen against the influx of sand. In these bars there is frequently, not to say usually, encountered a kind of fine clayey sand or *mole* which, when filled with water, as it generally is, presents the most difficult problem the native placer miner is called upon to solve. This *mole* is found also in thick strata in the playas always below water level.

It is the presence of this treacherous material that is largely responsible for the fact that there exists today many promising playas awaiting exploration by Americans with modern machinery. When the native encounters *mole*, it is a question as to whether or not he will succeed in excluding it and get to the "pay" below. He depends upon fern leaves and the leaves of the *caña brava* laced in between and behind the stakes. If the bed is heavy, the influx from below may be so strong as to compel the abandonment of the pit. However, if he succeeds in conquering the *mole* and the flow of water is not too great, the remaining part of his work is comparatively simple. The *cinta* or stratum of gold-bearing gravel lies just below the *mole*. It is loosened by the *almocafre*, shoveled into hand barrows and carried up the runways, made of logs flattened on top, to a long tom, or short sluice, where it is washed.

In shoveling the place presents a peculiarity that is viewed with scant patience by the American miner, particularly if he has absorbed some notions of scientific management. If the hand barrow sitting on the runway is at an elevation slightly above the shoulder of the shoveler, he declines to make the effort to raise the material, but insist upon having the assistance of another peon at his elbow, the duty of this auxiliary being to hold a small *batea* into which the gravel is shoveled. The auxiliary peon then raises the *batea* with the shovelful of gravel and dumps it into the hand barrow. As the shoveling point is 10 ft. away from the hand barrow, two auxiliaries are employed to pass the *batea*.

The Native Pump

Water is removed from the pits by means of hand pumps constructed from materials found near at hand. Within their range these pumps are effective. The tube is made from the trunk of a particular kind of palm tree. The soft, pithy interior is scooped and bored out by means of an instrument resembling the spoon or earth auger of the Empire drill. The interior diameter of the tube is between three and four inches, the length from 10 to 14 ft. The valve end of the tube is bound tightly with strands of native rope placed in circular grooves. This is to prevent splitting the tube when the valve plug is driven in. The valve plug, 12 to 14 in. in length, is bored hollow for half its length and an opening is cut to communicate with the outside. The wood-capped leather valve is nailed on the end of the valve plug that is inserted in the tube. The lower and solid part of the valve plug serves as a foot for the pump keeping the intake opening above the sand and gravel of the bottom.

Pump Is Adaptable to All Circumstances

Perhaps the most unique feature of the pump is the plunger, piston or bucket (Fig. 6) though none of these names defines it. A pole four to five feet in length and having a diameter of one to 2¾ in. is fitted with a cross handle like the handle of a gimlet. The other end of the pole is cut to a smaller diameter for a distance of 1½ in. from the end, leaving a shoulder. This part of smaller diameter is passed through a hole of equal diameter in the center of a disk of green or thoroughly soaked rawhide. The diameter of this rawhide disk is from six to eight inches, depending upon the diameter of the bore of the tube. To the outer edge of this disk and equally spaced are fastened six rawhide straps about six inches in length and three-fourths of an inch in width. These straps are nailed or tied to the pole at such a distance above the shoulder as to allow the soft disk to form a pocket or sack, the outer diameter of which, when expanded by the pressure of the water, will be sufficient to permit a more or less tight fit in the working barrel of the pump tube. The flexibility of the plunger allows it to fit all the irregularities of the interior of the palm stalk crudely fashioned as it usually is. Riveted sheet-iron pipes of four, six, or eight inches in diameter may be readily converted into hand pumps by the use of such valves and plungers. The rivet heads inside of the pipes seem to have no effect upon the working efficiency of pumps thus constructed, so great is the adaptability of the flexible rawhide plungers.

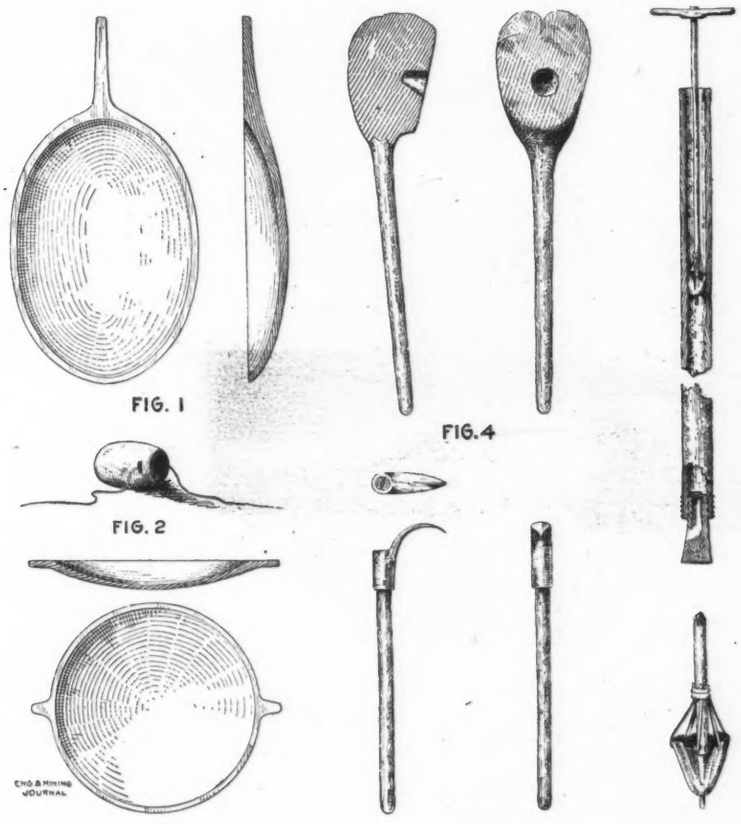
The pumps in their working positions stand at angles from 35° to 50° from the horizontal and raise water from six to eight feet in vertical height. One lift is usually sufficient for pits sunk in the sand bars of the rivers. Where one lift is not sufficient, one side of the pit is cut down and a shelf is formed. The water is raised by one series of pumps from the bottom to the shelf and by another series from the shelf to the surface. As depth is gained and the flow of water increases the pumping keeps pace by increasing the number of pumps. In extreme instances as many as 20 pumps have been used to keep a 12x14-ft. pit free of water. As the work of each pump operator is equal to that of every other, and as the pay is equal, the boss of the pit insists on synchronous movement. If all keep time with the pacemaker no one is loafing.

Parts of River Cut Off by Dams

The most ambitious of all the native engineering projects for reaching the gold in the river bottoms is known by the name of the *tapado*. The *tapado* might be defined as a wing dam that bends back to the bank inclosing and cutting off a part of the river bed. The dam is constructed by driving stakes close together in a double line and filling the space between the lines with clay, well tamped in. The lines of stakes are separated by a space of about four feet. The stakes are fastened together by binding all to horizontal poles placed near the top. These horizontal poles are then bound to cross poles placed about every four or five feet. Vines, *bejucos*, from the jungle are used for the binding. Previous to filling in with clay, palm leaves are placed inside and against the stakes. When the *tapado* has been completed, the water is pumped from behind the dike and mining proceeds. At points near riffles or cascades, the

tapado dam may be run out from the bank above, and terminate at a lower level, going down the riffle. If the fall is greater than the depth of the water outside of the upper end of the *tapado*, The lower end is left open and no pumping is required, as the space inside drains itself.

At most of the large mines on the Porce River, where the playas are being worked by means of hydraulic elevators, the operators take advantage of a protracted dry season to put large *tapados* into the river, thus making accessible considerable additions to their workable territory. Since the borders of the playas adjacent to the river are almost without exception the richest parts, the areas thus added are highly remunerative.



NATIVE COLOMBIAN PLACER-MINING TOOLS

LEASING SYSTEM POPULAR

The river workers generally consume so much time in building their *tapados* that little is left of the dry season for the work of getting at the bedrock. Partly for this reason and partly from the fact that the natives find it the usual thing to do, the *corte* system consists in leasing small *cortes*, or areas within the mine or *tapado*, for a percentage of the product. This percentage depends upon the expected total yield and upon the liveliness of the competition for the opportunity to work a *corte*. If the mine or *tapado* has the reputation of being rich and competition is active, the owner may demand and get as high as 50 or 60% of the gold produced. On the other hand, he may not be able to secure leasers unless he concedes to them 80% of the product.

WAGES DEPEND ON AMOUNT OF GOLD RECOVERED

The river workers are aways required to pay 20% of their gross washings to the owners of the mines. The river miners have unlimited opportunities for concealing the amounts of gold they actually wash out, and their incessant shifting from one mine to another makes it a hopeless task for the owners to keep track of them. It is safe to say that a portion much smaller than 20% gets into the pockets of the owners.

The owners of the *tapados* keep out the water, receive, weigh and sell the gold. The lessees frequently sublet their privileges. The peons sometimes receive their food and lodging only and are promised a proportional division of one-half of the gold that falls to the share of the lessee or sublessee after he has paid his percentage. Sometimes the peons prefer to board themselves, particularly if they have families. Since they invariably live from hand to mouth, they must have some pay. In that event, their employer contracts to pay them one-half of the ruling wage and promises a proportional division of one-quarter of his share of the gold to complete their pay.

At other times the peon receives something less than the ruling wage and is promised by his employer a *pinta* as a final settlement. This is the product of a *batea* full of gravel taken from the bedrock. On the Porce River, 95% of all the gold is on bedrock or within a foot of it, so this method is sometimes higly satisfactory. The peon is always ready to take a gamble in a small way.

GRAVEL CARRIED FROM THE PITS

The operating force for each *corte* usually consists of one shoveler, rarely more, *batea* passers, hand-barrow carriers and washers, who wash the gravel and attend to the sluices. The lessee or sublessee generally acts as *capitan* or boss. Each pair of hand-barrow carriers will carry the loaded barrows a distance of only 25 or 40 ft., depending upon the steepness of the runways. As many as four to seven pairs of carriers are employed for each *corte*, where the runs are from 200 to 300 ft. in length. The transportation of the gravel for such distances is not infrequent at the playa mines, in which the gravel is from 40 to 50 ft. in depth.

As stated elsewhere, the wages of the pens are higher during the dry seasons, so that the cost for each peon (wages and food) will not be far from 70c. per day. During the wet seasons plenty of good peons may be employed at a total cost of 50c. per day each. The hand-barrows as loaded hold from 1 to 1¼ cu.ft. From 3 to 5 cu.yd. of gravel are removed from each *corte* per day at a cost of from 80c. to $2 per cu.yd. It takes good ground to stand such costs and to produce a profit. The *corte* system has been defined as the one designed to distribute the product of the mine to the greatest number of Colombians.

BEDROCK NEVER THOROUGHLY CLEANED

Within the last 18 months the native miners have learned a lesson from the Americans, who are putting in hydraulic elevators for the purpose of working the deeper water-filled gravels of the playas. The depth of the gravels range from 12 to 55 ft. Up to the present, these more progressive miners seem to have been so inadequately supplied with capital that their elevator equipments are too small to do more than serve as pumps and keep the pits fairly clear of water. These water elevators are so far superior to the old-time overshot water wheels used for driving four to six pumps, that the latter are now being but little employed. These ponderous slow-moving contraptions were never more than partially successful and enabled the miners to reach only the highest portions of the bedrock. The same ground formerly mined by natives with the aid of these water-wheel-

driven pumps, has since been washed by Americans, using hydraulic elevators with most satisfactory returns. The mining done by the Americans developed the fact that the natives of former times had succeeded only in cleaning up the ridges of the bedrock, whereas the best of the gold was found in the depressions.

Consolidated Mining & Smelting Co.

The Consolidated Mining & Smelting Co. of Canada, reports that for the fiscal year ended June 30, 1912, its profit was $310,346, or 5.35% on the outstanding stock. The Trail smeltery smelted 296,458 tons of ore, and produced 2,914,181 lb. of copper; 26,072,074 lb. of lead; 1,765,992 oz. of silver; and 129,789 oz. of gold.

During the year the company acquired the property of Le Roi Mining Co., in Rossland, and the Virginia mine. Since the close of the fiscal year the Abe Lincoln and the Iron Horse have also been purchased, all in the Rossland district. An option was taken during the year on the Hudson Bay group, near Salmo, but was dropped, and the Silver Dollar, also near Salmo, is still being investigated. Options were also taken on a number of properties in the Ainsworth camp.

The Snowshoe mine has been closed, which accounts for the lowered copper production, and the St. Eugene has been practically closed during the year. Phœnix Amalgamated was not operated, Number Seven only for a time, and only a small tonnage was produced from the Richmond Eureka. Developments were good in the War Eagle, Molly Gibson and in the properties of the Ft. Steele Mining & Smelting Co., that ship ore to Trail. A considerable amount of the stocks and bonds of the Ft. Steele company are held by the Consolidated.

A water-operated compressor plant was put in near the Sullivan mine (Ft. Steele company), and an additional one for the Molly Gibson. A new flue was built in the copper smeltery, and a matte-handling plant installed. Additional electrolytic lead tanks were put in, and the lead samplery altered extensively.

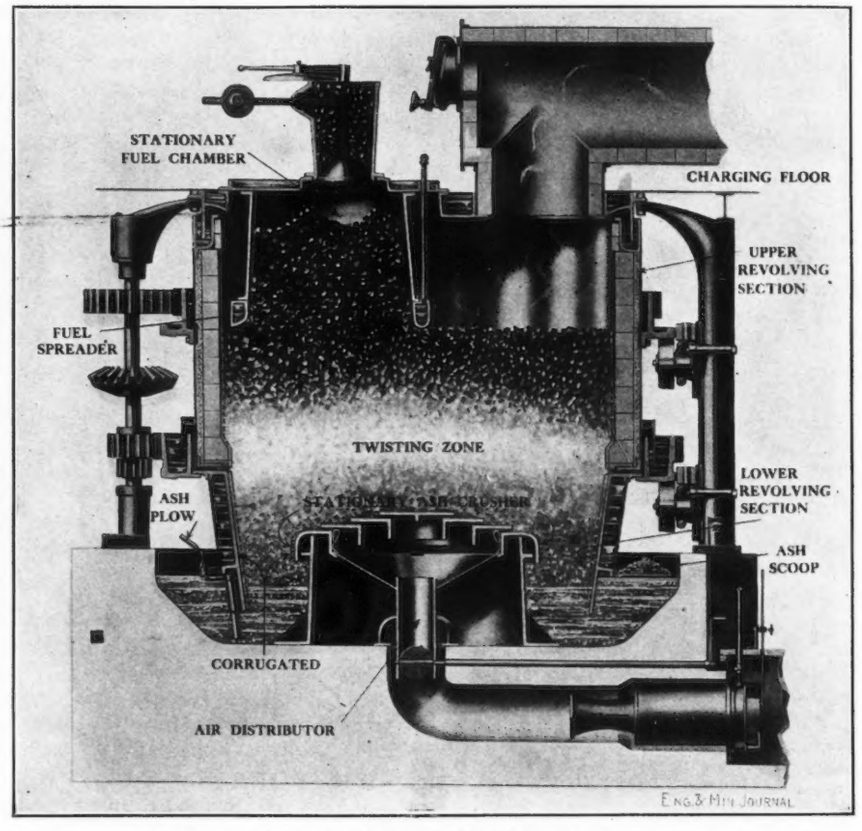
The company costs were increased about $120,000 during the year by the Crow's Nest Pass strike, and at the close of the strike the cost of electric power was increased to an extent which will probably increase the costs of the company by $40,000. However, many properties in the Slocan district have resumed work after years of idleness, and in general the prospects for the future are considered bright.

The company paid dividends last in 1907, and its surplus account stands at $1,183,635 on an outstanding capital of $5,805,200.

Chapman Rotary Gas Producer

The chief features of the Chapman rotary gas producer, shown in the accompanying illustration, are: (1) Mechanical feeding and spreading the fuel; (2) agitation of the entire fuel bed; (3) mechanical removal of the ash. The producer is made by the Chapman Engineering Co., of Mt. Vernon, Ohio.

The fuel chamber is water cooled at the lower edge, and holds about 1000 lb. of coal, enough to last half an hour. There is no separation of coarse and fine coal in this machine, and as can be seen, the most coal must be fed in at the low points and air holes in the charge, that is, just where it is most needed.



CHAPMAN ROTARY GAS PRODUCER

Agitation of the fuel bed is obtained by dividing the rotating bed in two sections, which travel in the same way, but with different speeds, giving a shearing action in the fire bed, and effectually filling any holes. This gets away from the method of using rabble arms, which keep burning off, even if water-cooled.

This shearing action, and consequent prevention of blow-holes, has the secondary effect of preventing clinkers, which are ordinarily formed around any such air holes in the fuel bed.

Ashes are removed by grinding the ash between the sides of the stationary corrugated wall of the air box, and the revoving corrugated wall of the lower section. After the ashes have been crushed they are forced up to the top of the ash pan by three adjustable ash plows, which are kept in continuous operation. As fast as the ashes are lifted to the surface of the water in the ash pan, they are automatically scooped up and carried to the required point for automatic discharge. The fact that the ashes in being removed are taken upward makes a difference of several feet in the height required for the gas house and foundation.

Gypsum in Utah

The gypsum deposits along San Rafael Swell, which lie east of the Wasatch Plateau and west of Green River, in east central Utah, have been investigated by the U. S. Geological Survey (*Bull.* 530-N). The deposits require little or no prospecting on account of excellent natural exposures, but no great quantity can be mined until better transportation facilities are available. The beds of gypsum on the west flank of the San Rafael Swell are estimated to contain 2,425,400,000 tons in the upper, and 7,276,200,000 in the lower bed. The deposits carry about 32.48% of CaO; 45.75 of SO_3; 20.56 of H_2O volatile at 300° C.; 0.36% of Cl, and traces of Fe_2O_3.

The Midwest Oil Co., operating at Casper, Wyo., will pay a dividend of $60,000 this month.

The Scandal of the Comstock

The following paragraph is quoted from the San Francisco *Chronicle* of June 20, 1912:

Twenty-seven thousand shares of stock in Alpha Consolidated, delinquent under the last assessment of 5c. a share, were offered for sale yesterday in the offices of the company and no voice was heard. Alpha is an undeveloped property that has been undergoing the regular assessments for office expenses and pumping fees. The market price of the stock reflects no physical value in the mine, but usually covers the amount of assessment money in the treasury. Yesterday's official quotation was 4c. bid—1c. less than the assesment, but 4c. more than the 27,000 shares brought at the delinquent sale. The offer of the stock in the offices of the company yesterday was followed by a sepulchral quiet.

There is nothing unusual about the above remarks. Substantially the same thing has been said year after year, not only in the case of one Comstock mining company but of many. The remarks that we have quoted, which we have selected quite at random, will serve as an introduction to a review of the management of the Comstock mines in general which may, we hope, throw some light on present scandals.

From beginning to end the history of the Comstock lode has been a chronicle of scandal. The chicanery of the earliest days was succeeded by the stock jobbery of the period of the Big Bonanza. Later came the operations of the mill ring, which conducted a system of simple and deliberate stealing until it was exposed and disrupted by the JOURNAL. Since then the production of the mines has waned and become relatively small; and the opportunities for Napoleonic plundering have ceased to exist, but the jackals find pickings after the tigers have gone and the spirit of graft still pervades the Comstock although the operations are but petty.

PRESENT PRODUCTION

According to Prof. George J. Young, who contributed to the JOURNAL of June 20, 1912, an excellent summary of the present situation of mining on the Comstock, the present output of the lode is about 15,000 tons of ore per month, yielding about $200,000, about 700 men being engaged in the mining and milling of this ore. About 5000 tons per month comes from underground stoping, chiefly in the Ophir, Mexican, Crown Point and Union Consolidated, about 5000 tons from the Chollar and Potosi croppings, and about 5000 tons from the Yellow Jacket dump. The cropping and dump ore is of low grade. The production of ore from underground is expected to increase as further progress is made on the plan of unwatering the mines, which is being prosecuted by the Comstock Pumping Association, a co-operative organization to which all the companies of the lode contribute, and the recent discovery of ore of good grade in what appears to be a body of some size in the Mexican mine has been an inspiration to such of the Comstock companies as really want to mine.

The major part of the Comstock mines are controlled by a group of San Francisco stock brokers and are operated for stock gambling purposes rather than for real mining. The Mexican mine is an exception and shows what can be done by intelligent, honest and modern methods.

DO THE COMPANIES WANT TO MINE?

Here we find ourselves at once confronted by the question which leads to the key of the Comstock situation, viz. Do the managements of these companies really want to mine? Professor Young says: "The stock exchanges list about 34 mines, the stocks of which are regularly bought and sold. Large as was the Comstock lode, it is difficult to conceive of such a number of companies flourishing at the present time. It is strange indeed that the Comstock should have survived so many years with the original organizations and the separate companies." It would be strange indeed if it were simply a case of mining. Considering, however, that the Comstock is still chiefly a basis of stock gambling it is not strange.

PSYCHOLOGIC PROBLEMS

Involved in this there are some psychologic problems. The Comstock shares have served as speculative chips ever since the beginning. As in playing roulette and faro, most persons lose their money, but now and then somebody makes a winning, which keeps the spirit alive. It is hardly conceivable that even the Comstock game could be kept going if everybody lost all the time. However, to the disinterested observer it does not appear that the Comstock shares offer such ordinary sporting chances as a reasonably square horse-racing meeting. Ask a Californian about it and he will tell you: "Our people have got to have something to gamble in. They can't play the Eastern markets—stocks, or grain, or cotton, etc.—because they are too far away, can't get the feel of them, and don't know the names of the chips, anyway. They know the Comstocks, have been born and brought up with them, like their fathers before them. They know that they are swindled, but after all it's just human nature."

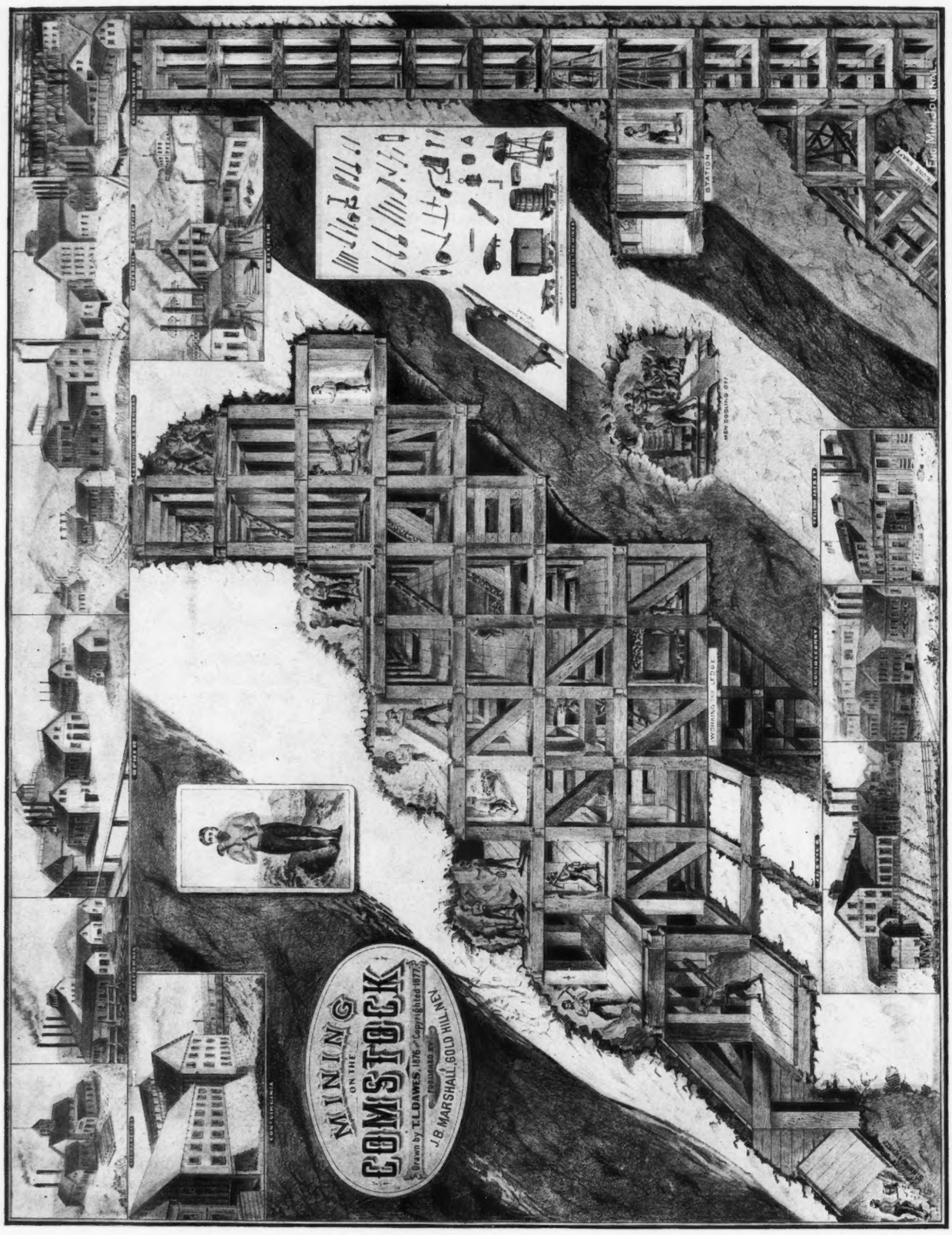
THE BROKERAGE RING

This is an argument that it is difficult to meet, there being no good in preaching morality to persons who don't want to be moral, or in giving warnings against a shell game to people who know all about it, but continue to play it nevertheless. Our interest lies in its bearing upon the mining industry. The prime consequence is that the capital stock of the Comstock mining companies is largely in the offices of, and in the names of, San Francisco brokers. The theoretical owners have no idea of being owners and don't want to be owners. Eastern brokerage houses carrying stock-exchange securities cause them to be transferred to their names but do not vote them, at least the most reputable houses do not, except under instructions from the legal owners. The San Francisco brokers carrying Comstock shares do not have the same regard for the ethics of the case, and vote the stock and control the companies. The evils that may develop under such a system may so easily be pictured by any intelligent imagination that no portrayal is necessary here. The dabbling in Comstock shares is, in fact, so disreputable that many persons who own them actually as an investment (such persons exist) are reluctant to let their ownership be known. In a few, very few cases, as in that of Mr. Slosson, the owners have come out in the open and declared their intention to operate their mines as mines, i.e., for the ore that may be obtained from them.

In the mines under the regime of the San Francisco brokers, besides the opportunities for rigging the stock market that they afford, a variety of small graft lies available. Salaries may be drawn for selves and henchmen installed in the official positions, of which there are plenty. The purchase of mining supplies gives opportunities for "rake-offs." When there is a mine product there may again be advantages that inure to private purses. In general the actual working of the mines, when such is done, is under the direction of "old timers," the relics of a previous generation, who are ignorant of modern methods and are wasteful. The managements don't care. Why should they? The public, which contributes the assessments that are levied, may be relied upon to supply heaps of money.

THE MEXICAN COMPANY

One of these Comstock cesspools has been cleaned out by H. L. Slosson, Jr., who in behalf of his own interests and those of Mr. De Sabla and others, as-



sumed possession of the Mexican Gold and Silver Mining Co., which they were entitled to by owning a majority of the stock. Mr. Slosson installed Mr. Whitman Symmes as general manager and Mr. Symmes organized a staff of young technical men, with whom the Comstock lode was previously unacquainted; and among them they have converted the Mexican into a mine that must be a revelation to the old fellows. By the introduction of a rational system of drainage and ventilation the dreadful heat of former times has been greatly ameliorated. The Mexican is still a hot mine but not much hotter than some mines at Butte, Mont., used to be. The air being good there is nothing excessively onerous in working in it. Pass from the Mexican mine into the Ophir and it is like going into an inferno. In the

Ophir the men work in "passes" in the old fashioned way, i.e., an hour at work and an hour to rest. In the Mexican they work a full eight-hour shift. As to the relative economy of the two systems no argument is necessary.

It is particularly gratifying that the management which has introduced modern methods in the Mexican mine has been successful in its prospecting and has opened a new orebody that is thought to justify all the ventures that have been made. Having obtained ore the company went ahead and put up a modern cyanide plant, dismissing from consideration the wasteful methods of milling practiced at some of the older mills of the district.

Why Not Consolidate?

The operations of the Mexican company constitute a good example of what may be done on the Comstock. The visitor to that famous old district is immediately impressed by the magnitude of the mineralization and the idea that possibilities of rejuvenation must remain. The old division of interest among many companies strikes him as absurd and uneconomic and he thinks of the advantages of consolidation. Such a scheme was in fact considered a few years ago by the General Development Co., but was not undertaken. Californians say that an actual consolidation would be inadvisable, because of the psychology of the stockholders on the Coast, who must still have chips of many colors to play with, but the elimination of the brokerage ring, the assumption of the respective managements by the real owners of the respective properties, and coöperation in the mining and milling of the ores are all things that are desirable and advisable. Among mining engineers there would be no two minds about those things.

An Old Comstock Print

In connection with this article it is interesting to present an old Comstock print, showing something of former methods of mining. Modern mining as conducted in the Mexican property exemplifies great changes. The dangerous, balloon-like shaft-houses have disappeared. Also the cooling rooms in which the miners sprawled on cakes of ice. The print is particularly interesting in its showing of the square-set system of timbering, which was introduced on the Comstock by Philip Deidesheimer in 1860. In that year a vast body of rich ore was cut on the third level of the Ophir mine. In width it was from 80 to 120 ft. and it was soft. The problem of extracting it baffled the local miners. Mr. Deidesheimer came from Georgetown, Colo., and solved it.

Philip Deidesheimer

Most of our readers will be surprised, we think, to learn that Mr. Deidesheimer is still living in San Francisco (2808 Clay St.). Unfortunately he is in destitute circumstances. He performed a great service to the mining industry, which ought to be recognized by the industry in some way that would make him comfortable in his declining years. The following is from a Reno, Nev., newspaper of not long ago:

> "I see," said an Old Comstocker, "that Philip Deideshiemer passed through Reno a few days ago. 'Deides," as we used to call him on the Comstock, was the greatest miner that camp ever knew. He was the man that made the mining of the Comstock possible by his invention of square-sets, a product of mining genius that has since been used in every part of the world where mining is carried on.
>
> "It is said that the artist does his work for art's sake. If so, Deidesheimer is an artist; for he never patented his great invention; and so never derived any pecuniary benefit from it. That's one reason, perhaps, why he is going about the rough mining regions, still working at his profession at his present age. I don't know the exact tale of his years, but he came to California from Germany in 1851, so it is safe to say that he is hovering somewhere around the 80 mark."

We believe that Mr. Deidesheimer is now upward of 80 years of age.

A Modern Charcoal Iron Plant

Not many years ago it was predicted that the advancing price of wood, and improvements in metallurgical practice at coke furnaces would put a definite end to the making of charcoal iron, says *Iron Trade Review,* Oct. 3, 1912. The charcoal-iron production was only 1.18% of the total 1911 production, but by adopting byproduct recovery plants for wood distillation, it is believed that the decline has been at least temporarily arrested by the charcoal-iron makers.

A modern charcoal plant is that of the Meshek Chemical & Iron Co., at Wells, Mich. Distillation is conducted in rectangular horizontal retorts, 46 ft. long, 6¼ ft. wide and 8⅓ ft. high. The retorts are made of ⅜-in. plates, set in brick walls like a boiler. The wood in 4-ft. lengths is piled on trucks and carbonized for 24 hours, 18 or 20 of which is at full heat. The charcoal is cooled for 48 hours in similar chambers except there is no outer brick setting, and the charcoal is not touched by hand until it enters the furnace bins. From one cord of wood are obtained 50 to 52 bu. of charcoal, eight to 12 gal. of wood alcohol, 150 to 200 lb. of calcium acetate, and five gallons of tar.

The blast furnace owned by the Stephenson Charcoal Iron Co., near-by, is 60 ft. high, 10 ft. in diameter at the bosh, designed for 80 tons per day and is arranged for hand filling. Two Otis elevators in balance are employed for feeding. The bosh is cooled by streams of water directed against a bosh jacket. There is a dust collector 13 ft. in diameter by 15 ft. high, and blast is heated by two Durham-type iron-pipe stoves, each provided with 65 pipes in three rows. Fuel consumption is said to be less than in a coke furnace of similar size.

The Policy of the Geological Survey

In a paper entitled "A National University," in *Science,* Aug. 16, 1912, President Van Hise, of the University of Wisconsin, alleged the neglect of science by the scientific bureaus. He states that the U. S. Geological Survey "is almost exclusively a department of practical geology," and "is not contributing in any large way to the advancement of science." To these statements George Otis Smith takes exception (*Science,* Sept. 27, 1912).

He premises that there is some difficulty in debating the question, as it is not easy to state what constitutes "advancement of science," and what constitutes "practical geology," but answers the generalized charges of Van Hise as follows:

Geological Survey Meant to Be Practical

"Geologic research as conducted under government auspices should, in my opinion, be largely practical. The purposes for which the U. S. Geological Survey was organized are practical, and the administrator who would venture to disregard the plain intent of the organizing legislation would not contribute to the ultimate advancement of science. The Survey began on practical lines, Director King arranging the initial work in districts offering 'examples of instructive geological structure and great bullion yield,' and even that classic work of science planned as the first monograph of the new survey, 'Lake Bonneville,' had its practical side, the hope having been expressed by Mr. Gilbert himself in a report of progress 'that a critical investigation of the secular oscillations of climate in the past will help to solve the problem of secular change which is of such vital importance to the agriculture of an arid domain.'

"The most recent index of the trend of the Survey's work is afforded by the schedule of manuscripts being edited August 15, which affords some basis for judging of the character of the publications now in hand. The publications issued each year are known to the public, although I might mention as noteworthy in this connection two contributions that are just coming from the press: Monograph LI., 'Cambrian Brachiopoda,' by Walcott, and Professional Paper 71, 'Index to North American Stratigraphy,' by Willis. Of the 41 reports now being

edited five are engineering bulletins, embodying data incidentally collected in the course of topographic surveys, and therefore not chargeable to scientific appropriations; eight relate to Alaska and represent work done under an appropriation made specifically 'for the investigation of mineral resources' and therefore not to any large extent available for theoretical investigations, though the results of the work in Alaska are a splended contribution to our knowledge of the geology of the globe; eight are water-supply papers contributed from the work under another specific appropriation; six relate to economic geology; and the remainder, 14, may fairly be described as outside the 'department of practical geology.' This group of 14 includes six paleontologic reports, three descriptions of areas having no special economic importance, and one report under each of the following subjects—glaciers, Pleistocene geology, petrography, stratigraphy and mineralogy.

"That the U. S. Geological Survey concerns itself with the practical side is true now as it has always been in the past; whether its work is more or less devoted to practical geology than formerly can be decided according to one's taste or prejudices; but that it is almost exclusively a department of practical geology must be denied.

Scientific Conclusions Often a By-product of Practice

"Besides making general investigations in geology and highly specialized researches in paleontology, petrography, mineralogy, geophysics and geochemistry, which it will be generally agreed contribute to the advancement of science, the Survey is making other investigations whose theoretic results are so closely combined with the results of practical geology that their scientific value may be overlooked by some readers. In some cases the purely scientific conclusions reached are incidental to the practical investigation, but in many instances are essential to it. Today, as in the past, the study of ore deposits by the Geological Survey continues to yield a large measure of scientific results of the highest grade, and the five manuscripts on economic geology mentioned above are no exception to this rule. Most of these are not detailed descriptions of mining camps, but deal to a great extent with the aërial geology and physiography of the hitherto blank spaces on the geologic map of the United States. The broader studies are not neglected—a fact illustrated by a manuscript just received from Prof. W. H. Emmons on 'Secondary Sulphide Enrichment,' which represents results gained in the course of economic work in several mining districts during the past twelve years. That the answers to the problems of chemistry and physics here discussed possess a practical present value to the mining engineer in nowise detracts from their permanent value to the broad science of geology.

"An example of work on a broad problem that concerns a number of states is afforded by the general and detailed study of the Atlantic and Gulf Coastal Plain, which for five years has been prosecuted under the direction of T. W. Vaughan, with the coöperation of several state and federal geologists. Similarly, the mapping of the San Juan region by Whitman Cross serves as a notable example of a general investigation of broad scientific interest, covering two decades. A third illustration is to be found in the geologic work of Messrs. Campbell and Alden in the new Glacier National Park. It is conceivable that the publications resulting from such geologic investigations will stand as large contributions to science, and when this literature has been illumined by the added glamor of the years, the Geological Survey of today may be cited as again 'the center of the world for the advancement of the science of geology.'

"More than this, the application of geology to economic problems has a reflex effect upon the science. The association of the scientist with the engineer is beneficial to both. The geology that is applied to big problems, whether of engineering or of governmental policy, must be not only qualitatively true, but also quantitatively exact. So the entrance of the Geological Survey into the administration of the public lands has modified field methods and established standards of accuracy not before demanded. The result is that the geologist who works in terms of 40-acre tracts observes details that were overlooked by his predecessor who looked the country over by the square mile.

Survey's Work Giving Geology a New Standing

"The recognition of the applicability of geologic data collected by government scientists to the administration of the public lands is in itself, I believe, a large contribution to the advancement of science. The field of science is broadened and the standing of science is dignified. The remark of the geologist whose experience had been gained largely in the East but who is now working in a Western mining camp illustrates this: 'It is a satisfaction to be looked upon as a worker and not have to make apologetic explanations as to what geology means.'

"Another illustration is afforded in the work of the Geological Survey in connection with the proposed forest reservations in the East. For years the geologists and hydrographers of the Survey had taken interest in the question of the relation of forest cover to stream flow and as opportunity afforded had made observations bearing on the question. The results, however, were at best only qualitative and to some extent confusing. The Weeks Act, however, specifically laid upon the Survey the burden of making an affirmative showing of the regulative effect of the forest upon stream flow, before land could be purchased, and then an investigation was planned with the purpose of obtaining conclusive results. That the Survey withstood popular clamor until its investigation was concluded and reported only on observed facts may of itself have been a possible aid in advancing science. As an intensive study, the hydrometric survey of selected areas in the White Mountains is believed to be without parallel in the world, and it has yielded quantitative results which, when thoroughly digested and compiled, will be published as an important contribution to science."

Concluding, Doctor Smith says: "This opportunity to apply science to an administrative problem came to the Geological Survey because its work was believed to be both practical and scientific; and I may add my opinion that whenever the Survey becomes exclusively 'practical' or exclusively 'scientific' it will cease to deserve either recognition or support. This idea has been best expressed by Brooks: 'Applied geology can maintain its present high position of usefulness only by continuing the researches which advance the knowledge of basic principles.'"

Influence of Titanium on Iron Castings

The influence of titanium on cast iron is one of the debated points of metallurgy. Rossi, Moldenke, West, and Goldschmidt have obtained favorable results, other investigators unfavorable. In a paper before the joint session of the American Institute of Mining Engineers, and the International Congress of Applied Chemistry, Bradley Stoughton reports that he believes it of benefit both in increasing the tensile and transverse strengths. But the technique must be carefully watched. The metal must not be cast too hot or too cold; the titanium must be got into the metal, not into the slag; and the melt must be given full time to absorb the titanium.

Under these conditions it appears to reduce the amount of entrained slag, and probably through this, it seems to reduce segregation. It is not an alloying element, but works through its affinity for nitrogen, in which it stands first of all the elements, and for oxygen, in which it appears to stand between Si and Al (Keyser gives the heat of formation of TiO_2 at 97,772 cal.). In steel, 0.9 lb. per ton of steel is effective. While Stoughton believes either ferrotitanium or titanium-thermit to be advantageous, he believes the latter to be the less effective.

The Ahmeek Mill, Hubbell, Mich.

By Walter R. Hodge*

The mill of the Ahmeek Mining Co. on Torch Lake, Michigan, is of steel-and-concrete construction. Ore is transported by railroad from the mine, 10 miles distant. Four heads are now in operation with two different flow sheets. It is expected that four more heads will be installed next year and the treatment made uniform throughout the plant. Tailings are discharged into Torch Lake.

*Mining engineer, Houghton, Mich.

The Ahmeek mill is situated on Torch Lake, about one-half mile south of the village of Hubbell, Mich., and about 10 miles by rail from the mine it serves. The mill went into commission with two heads in June, 1910; another head started in January, 1911, and the fourth head began dropping in March, 1911.

The mill building is 218x190 ft. and its highest point is 122 ft. above lake level. It is of steel-and-concrete construction throughout and departs from local practice in mill building insomuch as it is built with two floors. The boiler house is an integral part of the main mill building abutting on the foundations of the rock bins. Other buildings are a concrete pump house and a frame carpenter shop. The mill building houses a small forge shop and a small machine shop. The heavier repair work is done in the shops of the Tamarack mill, distant to the south about half a mile.

Rock is brought from the mine over the Mineral Range R.R. tracks and enters the mill on a long steel trestle at an elevation of 106 ft. above lake level. Here it is dumped into steel bins of 1000 tons capacity each. These are the largest steel mill bins in the copper country. They are four lobed in horizontal section and measure in their largest dimensions 42x30 ft. inside. These four bins rest on reinforced-concrete foundations. The open spaces in the foundations are used for storage and for machine and blacksmith shops and coal bunkers. Coal is delivered over the trestle and drops by gravity to the bunkers. There are two tracks on top of the bins.

From the bins the rock runs by gravity to the stamps. As it enters the feed chute it passes under a spray of water. As the rock slides through the chute to the stamp the larger pieces of copper are picked out by hand and thrown into a bin for shipment to the smeltery. Broken timber and other foreign matter is also removed by the head feeder.

Capacity of Each Head 600 Tons per Day

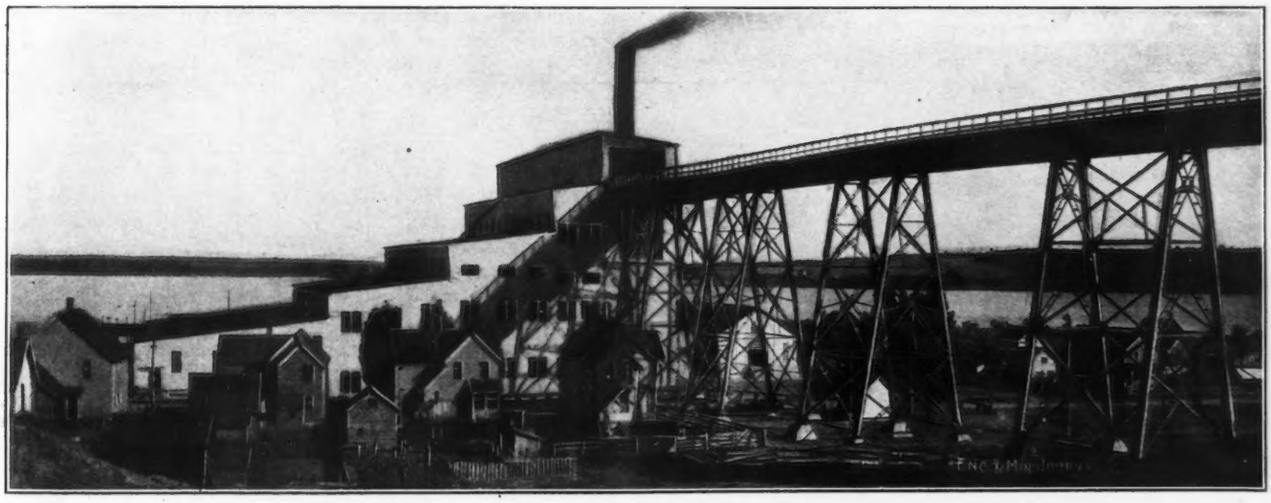
The stamps, four in number and set 44 ft. from center to center, are Nordberg compound steam stamps, dropping 106 times per minute. The high-pressure and low-pressure cylinders are respectively 16x24 in. and 32x24 in. Steam is used at 150 lb. and 36 lb. The valve gears of all four heads are actuated by one 75-hp. motor. The rock dumps directly on the dies, where it is crushed. The mortar discharge is two ways only, through screens punched with 5/8-in. round holes. Copper too large to pass the screens is removed by means of a hydraulic discharge, so periodical clean-ups of the mortar are unnecessary. The capacity of each head is about 600 tons per 24 hours.

The mortar is seated on a concrete base or mortar block, at an elevation 50 ft. above lake level. The block is in the shape of a truncated pyramid 40 ft. square at the base and 38 ft. high. This block rests directly on a slab of concrete 4 ft. 6 in. thick, which in turn rests on hardpan. A mile of steel cable is imbedded in each mortar block and slab, uniting them thoroughly.

Under the present arrangement the products of the two west heads are treated in a different manner from the products of the two east heads. Descriptions and flow sheets of one head in each section are given herewith. When the new heads, now planned, are added to the mill, the method current in the west half of the present mill will, in all probability, be used for all the heads.

Hodge Jigs Used in East Section

In the east half of the mill, after leaving the screens of the mortar, the 5/8-in. material passes over a hydraulic discharge, which removes the large pieces of clean copper and allows the remaining pulp to pass into a trommel, the screens of which are punched with 3/16-in. round holes. The oversize, discarded by the four trommels of each head, goes directly to an elevator and is returned to the mortar for further crushing. The pulp passing through the trommel screens goes over another hydraulic discharge, which removes the large pieces of clean copper, and drops into classifiers at the heads of sets of Hodge jigs. There are eight sets of these roughing jigs with four 2-compartment jigs to each set. Corresponding to each of the four jigs in the set is a spigot in the hydraulic classifier. The overflow of the classifier runs to one of eight settling tanks in the basement of the mill. The plungers of the jigs operate at a speed of 165 r.p.m.,



The Ahmeek Mill on Torch Lake, Michigan

and have a stroke of from ¾ in. to 1 in. The screens used on No. 1 are 8-mesh and 10-mesh, on No. 2, 10-mesh and 12-mesh, on No. 3, both 12-mesh and on No. 4, 12-mesh and 14-mesh. The screens are skimmed by hand for copper. All skimmings, ⅜-in. copper and ⅝-in. copper, are carried to a bin at the lower end of the mill by a shaking launder, and loaded into a gondola for shipment to the smeltery. The other products are collected from the various boxes by small tram cars, hoisted on an elevator and dumped into a hopper-bottomed mineral car for shipment.

screens; No. 2, 12-mesh and 12-mesh; No. 3 and No. 4 jigs are equipped the same as the corresponding roughing jigs as to screens. The tails of the finishing jigs are wasted to the lake. The hutchwork of the first compartment of all four jigs is "product" and is shoveled into a chute which delivers the copper to small tram cars on the ground or basement floor. The hutchwork of the second compartment of jigs 1 and 2 goes to a Hodge jig and that from the second compartment of jigs 3 and 4 to a Wilfley table. The hutchwork of the last Hodge jig is shipping grade, the tails go to the Wilfley

to the lake. The concentrates of the middling table are shipped, and the balance wasted to the lake.

Going back now to the overflow from the roughing-jig classifiers, we find it run into eight settling tanks, one to each classifier. These tanks are divided, for convenience of handling the pulp, into two groups of three and five tanks, respectively.

The thickened pulp of each group of tanks runs into a classifier. From the classifiers two products are taken, coarse and fine. The fine pulp of each classifier runs to six Evans tables.

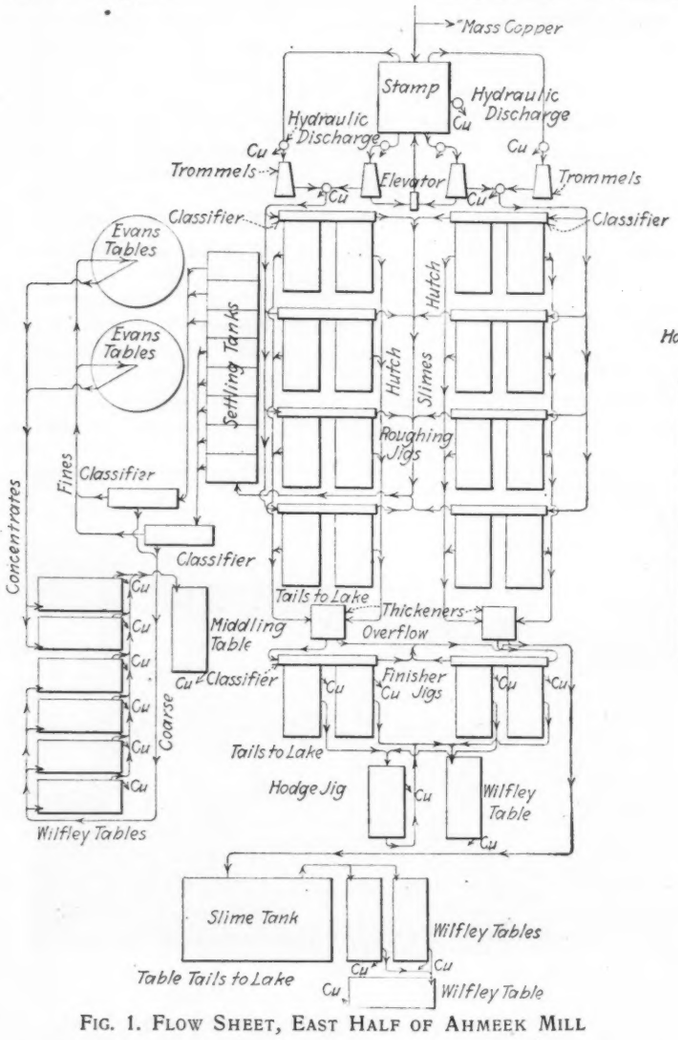


FIG. 1. FLOW SHEET, EAST HALF OF AHMEEK MILL

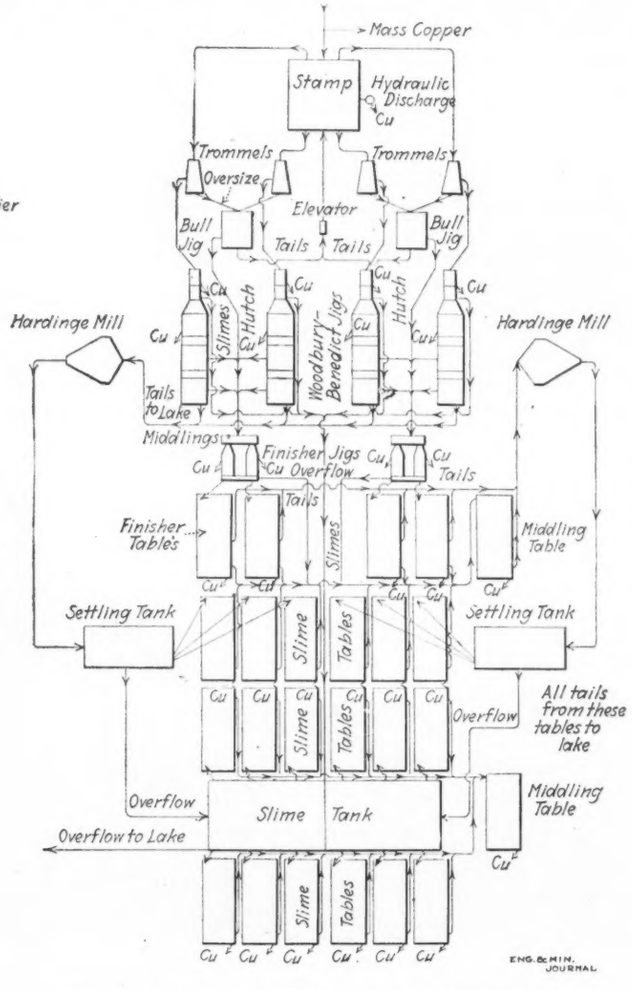


FIG. 2. FLOW SHEET, WEST HALF OF AHMEEK MILL

The tails of the roughing jigs are wasted to the lake, and the hutchwork is run to a thickening box. The overflow from the thickening box runs to a slime-settling tank and receives further treatment. The pulp from the thickener goes to a classifier at the head of a set of four Hodge finishing jigs. The overflow from this classifier joins the overflow from the thickeners in a settling tank. The plungers of the finisher jigs run at a speed of 175 to 180 r.p.m. with a stroke ranging from ¾ in. to ⅜ in. No. 1 jig of the finishers has 10- and 12-mesh

with the hutchwork of finishing jigs 3 and 4. The tails of the Wilfley are wasted to the lake and the concentrates are shipped to the smeltery.

WILFLEY TABLES TREAT SLIMES

The thickened slime from the overflow of the thickeners and from the overflow of the finishing-jig classifiers runs to two Wilfley tables having a throw of ⅝ in. and a speed of 240 vibrations per min. The concentrates from these two Wilfleys are product and are shipped, the middlings go to a middling table and the tails

These are round, wood-surfaced tables, 16 ft. in diameter, arranged in two groups of three decks each and revolving about once per minute. The concentrates from these six tables pass to two Wilfley tables, having ⅝-in. throw and running at a rate of 240 vibrations per min. They produce concentrates of copper, middlings which run to a middling table for further concentration and tails which are wasted. The coarse product from the classifiers is treated on four Wilfleys, which make products similar to those from the tables treating Evans table con-

centrates. All the middlings from these six tables come together on one middling table, which makes concentrates of copper and tails, which are wasted to the lake. The slime product is shoveled from the concentrate boxes into cars, weighed, elevated and dumped into shipping cars.

Woodbury-Benedict Jigs Used in West Section

At the west two heads of the mill the product of the stamps, after passing the ⅝-in. screens, goes directly to the trommels, with no hydraulic discharge intervening. These trommels are in all respects similar to those in the eastern section of the mill. The oversize, however, runs to two bull jigs having a 1¾-in. stroke. The screen of this bull jig is automatically skimmed by a cup, set into the mineral on the screen. The tails are returned by an elevator to the stamp for recrushing. The hutch runs directly to the classifier of the finishing jigs.

The ⅜-in. pulp from the trommels falls directly to a Woodbury-Benedict classifier, of which there are four to each head. This classifier makes three products, copper, sand and slimes. The copper is skimmed off automatically and continuously by a cup discharge set on the screen. The slime unable to penetrate the sand on the screen of the classifier is deflected by a shield and sent to slime-settling tanks at the bottom of the mill, and the sand is run over a series of three Woodbury-Benedict jigs, of which there are four sets to each head. The plungers of the classifiers and of the jigs following them make 195 strokes per minute and give a pulsation parallel to the flow of the feed. The classifier plunger has a stroke of ⅞ in., the first jig following ¾ in., second ⅝ in., and the last ½ in. The screens used are 10-mesh for the classifier and 12-mesh for the jigs. From the screen of the first jig is produced copper which is automatically skimmed and discharged into buckets. The hutchwork of all of the jigs is run to Hodge finisher jigs and the tails of the jigs wasted to the lake. Middlings are produced from the last two jigs in each series by means of a shield, the curved end of which dips into the bed of pulp on the screen and permits only the lower half of it to be discharged as middlings. These middlings from eight screens to each head, go to one Hardinge conical pebble mill, of which there are two to each head, for regrinding. Ordinarily the Hardinge mill is gear driven, but in the case of the mills in use here the gears have been replaced by pulley wheels surrounding the greatest diameter of the mill and permitting a belt drive. There is one 75-hp. motor to each two mills. The mills are 8 ft. in diameter, and make 26 r.p.m. They are lined with a silex brick laid in cement and the mills treating middlings from the Woodbury-Benedict jigs are fed with flint pebbles through the spiral pump at the head end of the mill at the rate of about 100 lb. per day. The product of these mills is pumped by a centrifugal pump to a settling tank.

Hardinge Mill Regrinds Tails from Tables

The hutchwork of all the Woodbury-Benedict jigs, together with the hutchwork of the bull jigs below the trommels is taken care of by two hydraulic classifiers and eight Hodge jigs. The overflow from the classifiers runs directly to a middling table, which also treats middlings from a part of the slime tables described below. The spigot pulp is run into the jigs. The screen and hutch give copper which is collected for shipping. The tails run to Wilfley finishing tables, of which there are four to each head. The middlings of these finishing tables go to one middling table, the concentrates are shipped as "mineral" and the tails are run to the second Hardinge mill of the head. Tails and middlings of the midling table are run to this same second Hardinge mill, which is similar in all respects to the first save that it takes about 180 lb. of pebbles per day. The product of this mill is also pumped to a settling tank.

The slime from the settling tanks of the two Hardinge mills is treated on six Wilfley tables. The overflow from the settling tanks goes to the same tank as the slimes from the Woodbury-Benedict classifier. The concentrates from the tables are "mineral," the tails are wasted and the middlings are treated on the midling table, which receives from the finishing tables and delivers middlings and tails to the second Hardinge mill.

The slimes from the Woodbury-Benedict classifier and from the overflow of the Hardinge mill settling tanks is treated on 12 Wilfley tables. The middlings of all 12 tables are treated on one middling table, the concentrates are all "mineral" and are shoveled into cars for weighing and the tails are wasted to the lake.

All the waste product of the mill except that of the tables on the lower floor of the mill run by gravity to the lake. The waste of the lower floor is pumped by centrifugal pumps to the discharge launder. The tails are sampled while passing through a small building *en route* to the lake shore. The Ahmeek mill has a frontage of about 2000 ft. on Torch Lake, where the maximum depth of water is 90 ft. This provides ample storage room for the sands of many years.

The boiler house is immediately behind and an integral part of the structure supporting the rock bins. It contains six locomotive boilers of 200 hp. each, and furnishes the power to run the stamps, generator and pump. The boilers are stoked by hand. The present boiler plant is but one of two equal units planned for the enlarged mill. Next year another four heads will be added to the mill and the second unit of boilers put in place. The stack now in use is a self-supporting steel structure 170 ft. high and 15 ft. inside diameter. It is brick lined.

The pump house is just south of the boiler house and contains a Nordberg pump of 40,000,000 gal. daily capacity. This is large enough to supply all the heads in use and proposed at present. The intake is 600 ft. to the east of the mill on Torch Lake. In the pump house is also a 300-kw. Northern Electric generator, which furnishes power to the six 75-hp. motors in the mill—one for driving stamp valve-gears, two for four Hardinge mills, two for tables and jigs on top floor of mill and one for driving basement equipment.

The Ahmeek mill has produced during the first half of this year, 7,779,023 lb. of copper at a concentrating cost of 0.73c. per lb. of refined copper. This was produced from 315,003 tons of rock stamped. The copper carries a little silver, but not enough to make hand picking worth while. During the six months ended July 1, 1912, the rock stamped ran 24.7 lb. to the ton.

West Australian State Batteries

Of the various state batteries erected by West Australia, 33 were in existence at the close of 1911. From the inception of the battery system to the close of 1911, there have been 843,780 tons of gold ore treated, producing £3,146,990 worth of gold by amalgamation, £429,274 worth by cyanidation, £88,974 from slime treatment. In addition 51,553 tons of tin ore have also been treated, producing tin worth £68,701.

The cost of running these batteries was £60,062 in 1911; the revenue, £53,322, from which £751 in additions were paid for, leaving a net loss for the year of £7491. The loss on operations since the start amounts to £28,870, and capital expenditure has been £290,733. The object of these batteries is, of course, to stimulate *bona fide* mining, but we note the Linden inspector makes particular mention that some properties which crushed rich grass-root ore in the government battery have done nothing further in the way of development, and are now under water at small depth.

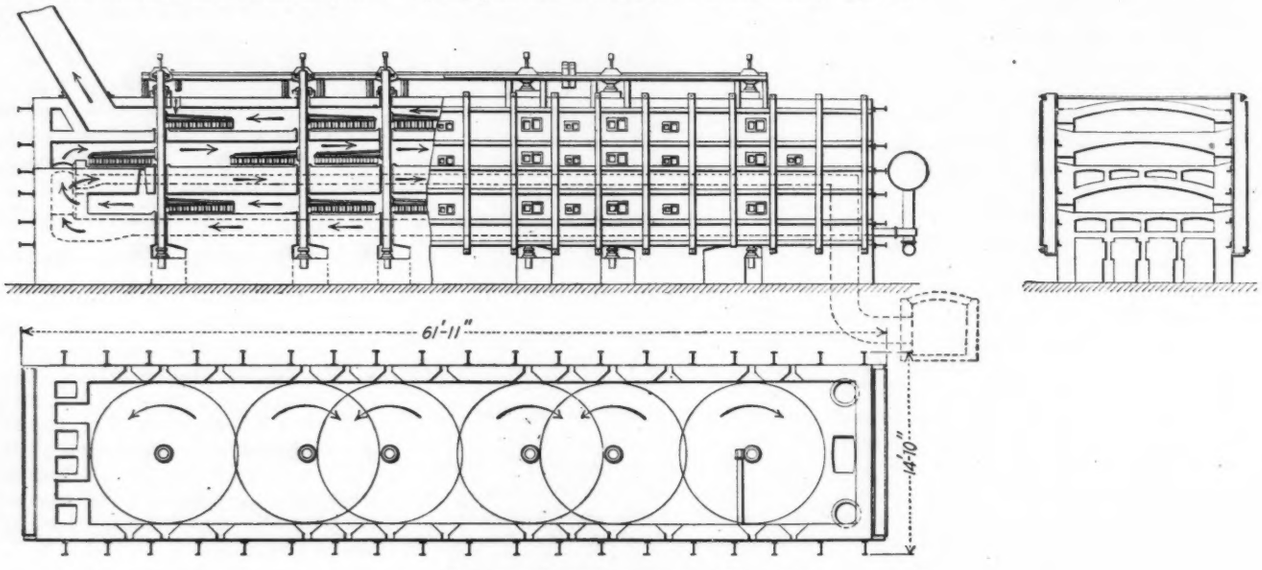
Over ten billion bricks were produced in the United States during 1911, according to Jefferson Middleton, of the U. S. Geological Survey. Of this number over eight billion were common brick valued at $49,885,262. New York led in the brick production. In the manufacture of clay products Ohio leads with a production valued at $32,663,895.

The Principles of Blende Roasting—II

W. Hommel discusses the agreement of the various forms of blende-roasting furnaces with theory, and makes a comparison between the various installations.

Note—Translated by O. H. Hahn, from an article by Dr. W. Hommel, in "Metallurgie," May 8, 1912.

An examination of most of the hand furnaces in use at the present day, the larger part of which are constructed on the principles of the Hasenclever furnace, teaches us that they fulfill the requirements as laid down in the previous article, in a few points only. The old Liebig-Eichhorn furnace answers the purpose much better if its shape is altered somewhat. A position of the muffles at right angles to the course of the fire gases is advantageous, as it is conducive to a much more serviceable draft and allows an unhampered and almost unlimited working of the ore. Further, the labor in such muffles is much simpler than in the Hasenclever furnace, as it is performed in a longitudinal direction and consists entirely in moving the rabble forward and backward, or in a simple pulling down of the roast to the next floor, while in the Hasenclever the rowing motion (with paddles), which is indispensable for moving the ore onward, is trying to the workmen.



MERTON BLENDE-ROASTING FURNACE

UNDUE AGITATION LEADS TO FLUE LOSSES

In some quarters, as for instance in the case of the constructor of the Landsberg[1] furnace, the view still obtains that in the scraping manner of working the blende are hidden certain mysterious advantages. But this is not so. Some people think a good deal of it and imagine they are doing a great thing if they make the blende "fly." These are but useless jugglers' tricks and only conducive to heavy losses in flue dust. All that is wanted is constantly to bring new particles of the charge in contact with air by frequently turning it over, which is amply effected by the simple forward and backward motion of a rabble.

The experience I had with a hand furnace constructed by me on these principles confirmed what has been heretofore said, and the correctness of my statements is fully borne out by the Delplace furnace (a modified Maletra) coming more and more into use in Belgium. The position of the muffles in this furnace is analogous to that of the Liebig-Eichhorn furnace. The defective conduction of the fire gases in the latter is replaced by an ingenious mode of firing, in which the waste heat is utilized as much as possible for heating the air needed for combustion and for heating the last muffle.

In consequence of this arrangement these furnaces put through more than the old Hasenclever furnaces, in spite of their smaller hearth area, and with less consumption of coal. I consider the heating arrangement unnecessarily complicated, connection with a gas producer would be simpler and afford the same advantages. Firing with producer gas should be a *conditio sine qua non*, at least, in modern roasting furnaces, for only with that will all conditions for good and quick blende roasting be fulfilled.

ROASTING IN MECHANICAL FURNACES

A description with cuts of a number of such mechanical furnaces has been given by Schütz, in ENGINEERING AND MINING JOURNAL, Mar. 16, 1912. I will, therefore, confine myself to a discussion of their principles and make some additions and corrections.

Mechanical furnaces may be divided into two main classes, according to whether the hearth or the stirring apparatus is moved. To the first class belong: (1) Revolving cylinders, truncated cones, etc., with horizontal shafts; (2) revolving-hearth furnaces with vertical shaft.

The second class includes: (1) Long-hearth furnaces with one or more floors in which the rabbles move in a longitudinal direction; (2) furnaces with revolving rabbles (scrapers or plows).

The Hommel furnace which was designed and patented by me may be considered a combination of these two main classes. In it the ore is roasted preliminarily on a revolving hearth and brought to a finish on an annular, immovable hearth by scrapers attached to the circumference of the revolving hearth, which moves the ore in the lengthwise direction of the annular one.

REVOLVING CYLINDERS

These furnaces present the most unfavorable conditions for blende roasting. The ore can only be present in a comparatively thin layer in order to get properly mixed, and on that account the proportion of gas space to ore volume will

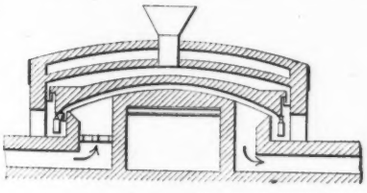
[1] It is called Stolberg furnace in Schütz's article on "The Practice in Blende Roasting;" cf. Eng. and Min. Journ., p. 559, Mar. 16, 1912.

be more nearly as 20: 1, than 1: 1.. The utilization of air will, therefore, be poor, and the SO_2 content of the roast gases low unless a long cylinder or a whole series of them is used, or, unless the air is set in a whirling motion. A rational heating in a single cylinder and a complete separation of the roast gases from the fire gases are highly improbable.

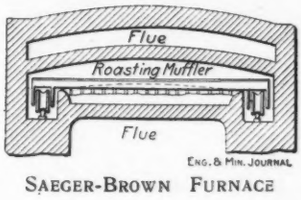
Nevertheless, more than 10 years ago, a cylinder furnace was arranged as muffle furnace by Köhler and put into practical operation at a works in Lipine, Upper Silesia. Its capacity was small, but the constructor was sanguine of an ultimate commercial success.

Revolving-hearth Furnaces

In revolving-hearth furnaces the movement of the material takes place in a radial direction from the center. Hence the ore describes approximately a spiral in passing through the furnace. Arranged as a reverberatory this kind is eminently fitted for the preliminary roasting of lead ores in combination with the Huntington-Heberlein process. It surpasses any other system in regard to low first cost and repairs, small coal consumption and reliability. The consumption of power is also small, as it does not exceed one horsepower even with large sizes putting through 50 tons per day.



Hommel Furnace



Saeger-Brown Furnace

The construction of such a furnace as a muffle furnace is, however, connected with considerable difficulties. The indirect heating of the revolving hearth can be accomplished either through a stationary firebox or with one that revolves with the hearth. The air for oxidation is best admitted at the circumference of the hearth and allowed to leave in the center of the furnace. Only in this way will the air be fully utilized and gas rich in SO_2 obtained. And further, only in this way can the heat of the roast gases be made serviceable in heating the freshly arriving ore. From this it follows that furnaces in which the whole surface of their revolving hearths is made use of are to be preferred to such which have only a revolving annular hearth.

The arch question plays an important part in these furnaces. It is obvious that the hearth must have a fairly large diameter if the furnace is to put through a considerable tonnage. As the stability of the arch requires not less a rise than one tenth, it follows that, with diameters of eight to 10 m. the muffle will be disproportionately high in the center. A dead roast of blende in this furnace is, therefore, an impossibility; it can only serve as preliminary to a special finishing hearth, like the annular hearth furnace connected with it, as proposed by the author. The idea of a fire place revolving with the hearth has been proposed and carried out by Zelewski.

Furnaces for Straight-line Rabbling

In the furnaces of this class the ore is moved lengthwise of long rectangular hearths. The rabbles are fastened to a cross-bar which runs on rollers on both sides of the hearth. The dimensions of the hearths are limited inasmuch as a maximum width cannot be transgressed without making the muffle disproportionately high.

Further, on both sides of the hearth a free space for the rollers carrying the rabble guides is needed and, as the height of the rabble arm is equally high in the center and on the sides, the abutments of the arch must be correspondingly high, and the proportions, therefore, become still more unfavorable. They approach those of revolving cylinders and have the same disadvantages, to wit: Bad utilization of the muffle space, hence defective utilization of the air supplied and excessive consumption of coal.

In order to get the full benefit of the air the hearths must be very long. The one-story Saeger-Brown furnaces at the works of von Giesche's Erben in Upper Silesia have been built with hearths of over 100 m. in length, the rabbles are pulled through the furnace by means of chains and conveyed back over the arch. In spite of their great lengths the tonnage of these furnaces has been relatively small (rather less than 10 tons) and the consumption of coal high. The dotted line in the illustration shows where the top of the muffle would come if it were not for the space required by the rollers.

Rcently a Hegeler furnace has been erected at enormous expense. The total length of the seven hearths of this furnace amounts to 160 m. Hence the ore has a long way to travel. The muffles are comparatively low as the rabbles are drawn sled-fashion through the furnace and do not need extra space for wheel guides. The abutments on both sides of the muffles can, therefore, be lowered correspondingly. This advantage is, however, more than counterbalanced by the slow turning of the ore which takes place in intervals of 1½ hr. This furnace is also dependent in a great measure upon a constant manual attendance. The long guide bars run empty through the whole furnace to catch hold of the rabbles at the other end. A workman is stationed there to watch that the hook end of the bar locks into the rabble and then signals to the engineer to reverse the motion. Then the frame on which the rabbles rest must be turned round and pushed to the adjoining muffle when the rabble travels back. This arrangement is not only roundabout, but primitive. It reminds one of the time of Newcomen.

The whole furnace occupies an area of 90x6 m., that is 540 sq.m.; the height is 16 m. which implies that it requires a large shed, with platforms to reach the upper muffles. Hence the cost of installation and repairs must need be enormous. Compared with hand furnaces there is no advantage to be gained unless it be through independence from the good will of the workmen.

Furnaces with Revolving Rabbles

These furnaces consist, for the most part, of a number of muffles arranged one above the other in which the ore is moved alternately from inside to outside and *vice versa* by means of revolving scrapers fastened to a common vertical shaft. Externally more or less resembling their prototype, the McDougal furnace, these furnaces have, in the course of time been perfected in their details, and are now extensively in use under various names as Herreshoff, Kauffmann, Evans-Klepetko, Scherfenberg, Wedge and others. They have proved of excellent service in roasting pyrites, copper pyrites and other ores rich in sulphur, but are not adapted to blende roasting. As preliminary to dead roasting they are inferior to a well constructed revolving-hearth furnace on account of their higher first cost, their cost of repairs and their minor reliability. The excessive formation of flue dust which is due to the ascending gases meeting the ore in its downward course from muffle to muffle is another disadvantage.

The improved Merton furnace occupies an exceptional position in this class of furnaces. In it the ore is moved forward on long hearths by means of revolving rabbles. By this arrangement the ore is stirred during its onward course at a livelier rate than in any other furnace. A modern Merton furnace has three muffles, one above the other, the lowermost of which is heated from above and below by producer gas. There are six water-cooled vertical shafts present, with arms, to which the rabbles are fastened. The two outer stirring arms move the ore steadily forward, while the four inner ones are arranged in pairs and form two minor zones, in which the ore is stirred vigorously. By a special arrange-

ment hot air enters the lowest muffle, thus insuring a perfect dead roasting of the blende. When in full operation the consumption of power is 6 hp. One man per shift can attend to four furnaces. One complete furnace costs 30,000 marks to build. A 12.5-ton furnace occupies about the same space as a Hasenclever block of four.

According to my views, this system fulfills the conditions of good blende roasting best of all. The height of the muffles is comparatively low because the guiding point of the rabbles, which in itself is the highest, coincides with the highest place of the muffle. The only thing that can be said against the furnace is that at various places not reached by the rabbles, dead corners will form in which the ore remains untouched. This is, however, a small disadvantage compared with the advantages the furnace offers. In order to remedy it, the idle ore accumulated may be pushed back into the circuit once a day by the attendant. This will, at the same time, serve as a check on the man and prove whether he is doing his duty by looking into the furnace from time to time. Recently several Upper Silesian works are said to have installed Merton furnace plants.

Comparative Value of the Various Systems

Herewith is presented a tabulated summary of the various furnace systems with their peculiarities. In the two last columns, the revolving hearth and the McDougal furnaces appear, although they cannot be used for a finishing roast. All items in this table refer to a two-shift, 24-hour working day.

MUFFLE FURNACE WORKING

	Hasenclever-Rhenania	Delplace	Hegeler	Merton	Revolving Hearth*	McDougal*
Furnace type	Single-hearth	Cross-muffle			four-hearth	six-hearth
Number of workmen	8	8	12	4	4	4
Put through per day, tons	7	10	40	50	60	30
Kg. per workman	875	1250	3333	12,500	15,000	7500
Kg. per sq.m. hearth area	54.7	100	65.8	80.5	300	200
Cost of plant, marks	20,000	20,000	250,000	4x30,000	4x30,000	2x70,000
Cost of plant per ton, marks	2857	2000	6250	2400	1666	4666
Consumption of coal, %	20	12	30	14	10	15
Consumption of power, hp	....	....	12	4x6	4x1	2x7
Hearth area, sq.m.	128	100	608	590	200	150
Desulphurization factor per sq.m. of hearth area	1	1.8	1.5	5.5	5.5	3.6
Operating expenses per ton:						
Wages, marks	5.71	4.00	1.50	0.40	0.33	0.66
Coal, marks	2.20	1.20	3.00	1.40	1.00	1.50
Power, marks	....	....	0.72	1.15	0.16	1.12
Repairs, marks	0.30	0.30	1.00	0.70	0.50	0.80
Amortization, marks	0.78	0.55	1.70	0.66	0.46	1.28
General expenses, marks	1.00	1.00	1.00	1.00	1.00	1.00
Total cost per ton, marks	9.99	7.05	8.92	5.31	3.45	6.36

*Cannot be used for finishing roast, but only for preliminary.

The number of workmen at the Hegeler furnace is especially high, as compared with the other mechanical systems. The reason of it is its mechanical imperfection, as pointed out above. At the Merton and the revolving-hearth furnaces, one man suffices for four furnaces, while one man can only attend two McDougals, on account of their great height, besides, each block of them requires a special fireman.

The explanation for the high output per square meter of hearth area of the preliminary roasting furnaces, is that the ore is not kept in the furnace for complete desulphurization, as it is in the other systems.

The costs of installation are highest for the Hegeler and the McDougal furnaces. They are most favorable in the case of the revolving-hearth furnace on account of their simple construction. The best comparison is shown by the cost of installation referred to the ton of raw ore put through. It will be seen from it that the revolving-hearth, as well as the Merton furnaces, are cheaper to build than the Hasenclever-Rhenania. The cost of the Hegeler is estimated rather low. The statements by Schütz made in regard to it do not agree with the facts.

Coal and power are lowest in the revolving-hearth furnaces. The consumption of power is comparatively higher by the Merton than by the Hegeler, on account of the greater intensity of the work performed.

The comparatively low desulphurization factor of the Hegeler and Merton furnaces is partially owing to the fact that the height of the muffle does not come up to the ideal one yet and partially to the necessity of leaving the ore longer than absolutely required in the furnace to afford a uniform desulphurization. The desulphurization factor of the Hasenclever has been put down as equal to 1, since it is the lowest. It represents in a sense an average figure, for, it differs in the three muffles, as has been shown, as 1: 2: 4.

Operating Expenses

For the calculation of the various items, the following figures, which vary naturally with the locality, were made the base: Wages, 5 marks per shift; coal, 10 marks per ton; power (electric), 0.10 marks per horsepower-hour.

The amortization was calculated for 10 years. The repairs at the Hegeler furnace have been assumed rather low. From the comparison of the total operating expenses, it follows that the Hegeler furnace does not afford any saving, while in the Merton it amounts to nearly 50%. The operating expenses of the revolving-hearth are so low that there is room left for combining with it one or two finishing hearths.

The Royal Japanese Steel Works, at Wakamatsu, have contracted for a 5-ton Roechling-Rodenhausen electric induction furnace to be operated by polyphase current. This furnace will be used for making alloy steel for castings and special ingots for forge work and tool steel.

Rock Grinding with Balls and Cylinders

In grinding mills in certain industries, R. O. E. Davis, of the Bureau of Soils, found cylindrical iron or steel pieces used instead of balls, their use being explained on the score of efficiency. In grinding phosphate rock, for instance, it was explained that balls became coated with ground rock and the mill had to be stopped to clean the balls, but that this did not happen with cylinders.

Laboratory experiments were reported to the International Congress of Applied Chemistry (*Proc.* Vol. XV, p. 73) in which equal grinding surfaces were used for feldspar grinding, the grinders consisting of ⅝x⅜-in. cylinders and 1-in. balls.

After five hours, the percentage passing 130 mesh was 45.5 for balls, 17.3 for steel cylinders, and 5.8 for wrought-iron cylinders. The amount adhering to the balls was 0.05%; steel cylinders, 0.30%; wrought-iron cylinders, 3.4%. The results, using equal weights of crushing media: Through 130 mesh, balls, 48%; steel cylinders, 35.2%; wrought-iron cylinders, 33.6%. Adhering to surface: Balls, 0.10%; steel cylinders, 0.26%; wrought cylinders, 33.6%. Equally decisive results were also obtained in grinding phosphate rock.

Tungsten Ore Production

In spite of its increasing electric use, there was a sharp decrease in 1911 in the production of tungsten ore, owing to the decrease in the demand for tool steels, in which the bulk of the tungsten produced is used, according to the U. S. Geological Survey. The production of domestic tungsten ore in 1911 amounted to 1139 short tons of concentrates, carrving 60% of tungsten trioxide; in 1910 the production amounted to 1821 short tons.

NEW PUBLICATIONS

ON THE ORIGIN OF THE HIMALAYA MOUNTAINS. By S. G. Burrard. Pp. 26, illus. Professional Paper No. 12. Survey of India, Calcutta.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, VOL. IV, 1911. 6¼x9¼, pp. 514, illus. D. Van Nostrand Co., New York.

A REPORT ON THE LIMESTONES AND CEMENT MATERIALS OF NORTH GEORGIA. By T. Poole Maynard. Pp. 285, illus. Bull. No. 27, Geological Survey of Georgia, Atlanta.

THE GEOLOGY AND ORE DEPOSITS OF PHOENIX BOUNDARY DISTRICT, BRITISH COLUMBIA. By O. E. LeRoy. Pp. 110, illus. Memoir No. 21, Canada Department of Mines, Ottawa.

EINFUEHRUNG IN DIE MARKSCHEIDEKUNDE MIT BESONDERER BERUECKSICHTIGUNG DES STEINKOHLENBERGBAUS. By L. Mintrop. 6¼x9½, pp. 224, illus.; 6 marks. Julius Springer, Berlin, Germany.

THE DESIGN OF WALLS, BINS AND GRAIN ELEVATORS. By M. S. Ketchum. Second Edition, Revised. 6¼x9, pp. 556, illus.; $4. McGraw-Hill Book Co., New York.

In preparing the new edition of this book, the author has added 150 pages and many cuts, all in Part I, relating to the design of retaining walls; Part II, devoted to bins and elevators, remains as in the first edition. The added portions are Chap. IA, in which Rankine's formulas for computing pressure behind retaining walls are modified so as to become completely general for all angles of surcharge, and Chap. IVA, which applies similar reasoning to the problem of sheeting a deep trench. Chap. IV, on the design of reinforced-concrete walls, and Chap. VII, on the practical construction and cost of them, are rewritten.

Viewed from the standpoint of engineers engaged in metal mining, it is to be regretted that the chapters on bins do not offer much help in the designing of timber-ore bins of small or moderate size; while, of course, the stresses may be similarly computed, most of the examples of actual bins are selected from those built of steel or concrete for large-scale operations. For those interested in the design of such structures, however, the book is a most valuable source of help.

DIE BERGWERKSMASCHINEN. Vol. II—GEWINNUNGSMASCHINEN. Edited by Hans Bansen. 6¼x9½, pp. 452, illus. Julius Springer, Berlin, 1912. 16 marks.

This book constitutes the second volume of a series of handbooks, of which Vol. I, on boring, was recently reviewed in this column. The editor was assisted in Vol. II, by the following engineers: Arthur Gerke, Leo Herwegen, Otto Pütz and Karl Teiwes, each of whom was the author of one or more entire chapters of the book.

Since coal forms the predominant mining industry of Germany, it is but natural that in this volume particular emphasis is given to those types of mining devices which are employed only in coal mining, such as auger drills, undercutters, etc.; the selection of types of machines, also, is made almost entirely from German and English sources. The scope of the volume is limited to the appliances used for blasting or otherwise breaking down material in mines and open workings; hoisting and pumping are omitted, and transportation receives only brief mention, though a long chapter is devoted to air compression.

The section on chain-bucket earth diggers contains probably the largest amount of information unfamiliar to American engineers; machines of this character seem to be much more generally employed in Europe than here, and have developed into a wide variety of types. A separate chapter is devoted to the special diggers designed for excavating lignite in open workings. European steam shovels appear to differ from American mainly in the construction of the dipper arm; American designs are well represented in the chapter on this subject. Itemized comparisons of cost form a valuable section of this chapter. Hydraulic mining is covered very incompletely.

The chapter on air compression is excellent, discussing briefly the theoretical aspects and then comparing many different types of machine; an interesting section describes electrically driven portable compressors, for transient service. Turbine compressors are also illustrated.

The chapter on coal undercutting and boring machines is extensive, and includes a number of designs unfamiliar in the United States. Among such are the types of machine used for boring a drift or small tunnel of circular section at one operation. As a means of detonating a charge of explosive, the electric method alone is described. The final chapter treats of the several mechanisms employed for breaking down coal without the use of explosive. The index is full and the entire volume is classified, subdivided and referenced in thorough German fashion. We are not acquainted with any single book in the English language which covers exactly the ground of this volume with any approach to its completeness of detail.

THE HYDROMETALLURGY OF COPPER. By William E. Greenawalt. 6x9, pp. 504, illus.; $5. McGraw-Hill Book Co., New York.

This new volume presents in a comprehensive form and covers very completely the field of hydrometallurgical treatment of copper ores; also incidentally, including the recovery of gold and silver hydrometallurgically. It is divided into two parts, viz. (1) Roasting; and (2) Hydrometallurgical Process, the second part occupying about two-thirds of the 500 pages of the book.

In Part I, are chapters upon preparation of the ore (crushing), fuels, pyrometry, etc., with a profusely illustrated chapter descriptive of the principal types of roasting furnaces, but the essential chapters in Part I, are the two, one upon oxidizing roasting, and the other upon chloridizing roasting, in which the author presents in a general manner the underlying reactions and principles of such roasting preparatory to hydrometallurgical treatment, and also gives typical examples; these, however, are almost entirely drawn from the practice of gold-silver ore lixiviation. While Part I may appear as preliminary, the proper preparatory roast, is, as the author states, an essential feature in hydrometallurgical extraction, and this part is well worth a careful perusal.

In Part II, after a chapter upon the properties and solubilities of copper, and the influences of the principal impurities, the author classifies hydrometallurgical copper processes under two broad heads, the purely chemical and the electrolytic, dividing the purely chemical into alkaline and acid processes, and the acid process again into sulphite, sulphate and chloride processes, under which different heads he describes, in more or less detail, the various processes that have been in actual use, or suggested or patented, taking the information mostly from articles which have appeared in the technical journals or patent-office reports. The author does not state in just what manner he made his selection, nor what standard for elimination he established for the processes that are not described, but one cannot but be impressed that the processes described have been well chosen, and are amply descriptive of what has been accomplished in the way of devising copper lixiviation processes, so that those who are interested have in this handy volume a very comprehensive view of the subject.

The presentation of the chemical and electrical data is also in convenient form, and the author's comments upon limiting conditions, as far as they go, are excellent. The author is an enthusiast with an abiding faith in the ultimate supremacy of the electrochemical treatment of all grades and classes of copper ore. While he utters no uncertain note as to the economical success of the process in which he is personally interested, he also presents with equal confidence the claims as to economic success of other processes. However, he refrains from such bursts of enthusiasm as he gave way to in his article in the JOURNAL, Nov. 12, 1910, and one may read, not altogether "between the lines," that he still sees obstacles to be overcome, but, as he truly says, the technical obstacles that appeared insurmountable in the days of the Hoepfner process, for example, have since been overcome in another branch of electrochemistry, and we cannot but hope for the overcoming of those still in the path of the electrometallurgy of copper.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

G. L. Sheldon has returned to Ely, Nev., after spending the summer in Alaska.

Charles P. Beresford is in charge of the Madura Syndicate, operating in Tepic, Mexico.

Ralph H. Moore has taken a position with Le Fe Mining Co., Zacatecas, Mexico.

H. W. Hardinge has gone to the Lake Superior copper region for a visit of about 10 days.

H. C. Hoover has returned from California to New York, where he expects to stay for two or three weeks.

Raymond Beignet is technical director for the Cia. Mexicana La Cera de Candelilla, at Galeana, Nuevo Leon, Mexico.

Oscar Lachmund has returned to New York after an examination of quartz properties in Yuba and Siskiyou counties, California.

Howland Bancroft will be engaged on examinations in the Magnolia mining district of Boulder County, Colo., for a short time.

Otto C. Morrill, of Norfolk, Va., has been appointed engineer for the Phosphate Mining Co., at Nichols, Fla., and has taken charge of the work.

David Taylor, of Salt Lake, Utah, has recently returned from an extended trip to New York on business connected with the sale of uranium and vanadium ores controlled by him in Colorado and Utah.

Rush T. Sill and Harvey A. Sill, formerly of Culiacan, Mexico, under the firm name of Sill & Sill, have opened offices in the Germain Building, Los Angeles, Calif., as mining and metallurgical engineers.

R. W. Brock, director of the Canadian Geological Survey, visited Rossland, B. C., on his way east from Victoria, where he had been attending the British Columbia meeting of the Canadian Mining Institute.

Frank Koester, consulting engineer, has removed his office from 115 Broadway to 50 Church Street, New York. Mr. Koester is principally engaged in steam and hydroelectric power plant work, electric transmission and traction.

L. D. Anderson, for six years past assistant chief engineer of the United States Smelting, Refining & Mining Co., has been appointed superintendent of the United States Smelting Co., with headquarters at Salt Lake City, Utah.

S. E. Bretherton has returned to San Francisco from a business trip to New York, stopping off on his return in Utah long enough to examine some copper properties in that State. For the present he expects to discontinue outside consulting work and devote his entire time to the interest of the Afterthought Copper Co., Shasta County, California.

Clarence P. Linville, after a service of nine years in charge of the Department of Metallurgical Engineering, and as professor of metallurgy, at the Pennsylvania State College, has resigned to accept the position of superintendent of blast furnaces with Joseph E. Thropp, and is now at Earlston (Everett P. O.), Bedford County, Pennsylvania.

OBITUARY

Joseph N. Pew died in Philadelphia, Oct. 10, aged 64 years. He was president of the Sun Oil Co. and the People's National Gas Co., and was a pioneer in the use of natural gas.

Societies and Technical Schools

American Iron & Steel Institute—At the latest monthly meeting of the directors 121 applications for membership were acted on, bringing up to 725 the total membership of the institute.

American Institute of Chemical Engineers—The fifth annual meeting of the Institute will be held at Detroit, Mich., Dec. 4-6, 1912. A number of the technical plants in and around Detroit will be visited and a program of papers and addresses presented. J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y., is secretary.

American Institute of Mining Engineers—The committee, in charge of the Iron & Steel Division, gives notice that, in addition to the papers promised for the Cleveland meeting, a list of which has already been published, the manuscript has been received of a paper on "The Most Recent Development in the Inspection of Steel Rails," by Captain Robert W. Hunt; and manuscript is promised at an early date on "The Heat Treatment of Steel," by Prof. Henry M. Howe, and on "Charcoal Iron," by J. E. Johnson, Jr.

National Council for Industrial Safety—At the recent meeting of the Association of Iron & Steel Electrical Engineers at Milwaukee, Wis., a special report was presented by a committee recommending the formation of a national organization to provide for future congresses and exhibits of industrial safety appliances. By unanimous vote the committee was at once made permanent as the National Council for Industrial Safety and will add to its number representatives of other bodies which concern themselves with safety problems. Officers were chosen as follows: Chairman, Fred C. Schwendtman, National Association of Manufacturers; vice-chairman, Lew R. Palmer, Association of Iron & Steel Electrical Engineers; secretary, Dr. Lucian W. Chaney, department of Commerce and Labor. For 1915 the National Council for Industrial Safety plans an international safety congress in conjunction with the Panama-Pacific exposition at San Francisco.

International Congress on Hygiene and Demography—In connection with the recent meeting at Washington an important exhibition of health and safety appliances was held, divided into several groups. In the group showing industrial and occupational hygiene, the most noteworthy exhibit was that of the American Iron & Steel Institute, one of whose purposes is "to promote health and safety in mine and mill." The exhibit was so large that supplementary space had to be secured. The Institute's principal exhibit was furnished by the United States Steel Corporation and its subsidiaries. On the walls were exhibited warning signals indicating danger and the need of caution. These were in many languages, to meet the needs of the men employed. Among the subsidiaries of the Corporation making exhibits of models and photographs covering all sorts of appliances for the prevention of accidents, the care of the injured, for providing water supply and toilet conveniences; pictures showing housing conditions and gardens, playgrounds for the children, and many other things calculated to promote health and happiness among the men and their families, were the Carnegie Steel Co., the National Tube Co., the H. C. Frick Coke Co., the American Bridge Co., the Oliver Mining Co. and the Tennessee Coal, Iron & Railway Co. The principal exhibitors among the independent companies were the Lackawanna Steel Co., photographs showing safety devices used in the mills and social service in the homes of the men; the Pennsylvania Steel Co., photographs showing provisions for safety in its mills; the Maryland Steel Co., photographs showing its herd of 100 Jersey cows used to standardize the quality and price of milk, and photographs showing its prize gardens; the Jones & Laughlin Steel Co., photographs showing the model housing conditions at its Aliquippa works; the Bethlehem Steel Co., photographs showing model yard conditions about its mills; the Cleveland-Cliffs Iron Co., photographs showing housing and social service at its mines; the American Blower Co., working model of its mine ventilator; Norton Co., models of its grinding wheels with their safety operating stands; the Thomas Iron Co., photographs showing its housing conditions; the Empire Steel Co., working model of its safety mine hoist and photographs of working conditions at its plants; the American Steel Foundries, safety appliances and photographs showing working conditions at its plants.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Oct. 9—Several hundred tons of waste was recently removed from the gloryhole of the Yellow Aster mine, in Kern County, to facilitate the caving of the upper ground and overburden, which was allowed to drop on Sept. 17. About 20,000 tons of ore and waste were caved and the breaking up of the ground, aided by the preparations in advance, has effected a large saving in the cost of boring and blasting. The ground was loose, and would have eventually caved, so the economic method of clearing the gloryhole was adopted. The ore will be separated from the waste and run through the stamp mills. The mills, one of 30 stamps, the other of 100 stamps, crush about 600 tons of ore in 24 hours. The 130 stamps have been dropping regularly for several years.

Denver

Oct. 12—The trouble between the union and non-union miners in the northern fields, mentioned in the last issue of the JOURNAL, still continues. The operators asked federal interference and an injunction to restrain the striking union miners from interfering with the operation of the coal mines. The operators claim that the governor of the state, the local authorities, and peace officers are in sympathy with the strikers, and that they cannot get protection from that source. Judge Robert E. Lewis denied the application for the restraining order and gave his reasons as follows: "This court has nothing to do with the quarrels between union and nonunion miners. Its only province is to protect the property of the plaintiff company. There is nothing in the evidence to show that there is any concerted effort on the part of the strikers, either to destroy the property or to prevent it being worked. All these quarrels and controversies between the strikers and the men who have been taken in to work in the mines, is incidental to the main issue. With them this court has nothing to do. I could no more enjoin the miners from quarreling with each other than I could enjoin *A* from murdering *B*, even if I had knowledge of the intention of the former."

The pyritic smeltery at Golden, formerly known as the Carpenter plant, owned by the North American Smelter & Mines Co., and which for many years has had an extremely checkered existence, recently passed into the hands of a receiver, G. L. Irvine, vice-president and general manager, being appointed by Judge McCall of the district court to fill that post. This was done on application of holders of the $500,000 outstanding bonds, interest on which had been defaulted. The smeltery has not been operated for one year. Ill-advised purchases of mining properties probably hastened the failure. Ten companies with a total capitalization of $16,500,000, most of which the receiver says are not involved in the failure, were promoted by the same men as the North American company. He also states that the action is of a friendly nature to protect the properties, that the company is solvent, and that it will be refinanced and operations resumed.

Butte

Oct. 9—The work preliminary to the building of a zinc concentrator by W. A. Clark is going along steadily. The mill is to be built on the North Side of Timber Butte, two miles south of the city, the steep slope making it an ideal site. The survey of the spur from the railroad to the mill has been completed and the grading is well advanced, a crew of 40 men being engaged in the work. Track laying will be commenced in a few days, and it is estimated that the road will be ready for traffic in about two months. The spur will connect with the Butte, Anaconda & Pacific R.R., about two miles north of the mill site, and as the mill will be at much higher elevation than where the spur joins the main line, it necessitates a grade of from 1% to slightly under 3%, and in places the curves are as sharp as 30°. The zinc ore from Mr. Clark's Elm Orlu mine will be transported by the Butte, Anaconda & Pacific R.R. to the point of connection with this branch line, and from there will be carried to the mill by electric motors. Water for milling purposes will be pumped from Silver Bow Creek to the mill, and a draw at the foot of the hill is to be used as a receptacle for the tailings. A concrete-lined dam containing a sluiceway is now being constructed across this draw to hold the waste products. The dam will also be used as a fill for the passage of the spur at this point.

By a referendum vote of the various coal-miners' unions of Carbon County, taken at Red Lodge, Oct. 5, upon the wage-scale agreement entered into in the convention of coal-mine operators and union representatives, held recently at Great Falls, the agreement was adopted by a majority of 63 votes.

During September, the Assay Office at Helena was in receipt of gold and silver to the value of $153,340, which was an increase of approximately $27,000 over the amount deposited during September, 1911. The amounts deposited by the various counties were as follows: Broadwater, $907; Chouteau, $17,769; Fergus, $24,749; Granite, $136; Jefferson, $189; Lewis & Clark, $29,206; Madison, $70,844; Missoula, $2459; Park, $330; Powell, $5551; Ravalli, $220; Silver Bow, $981.

J. J. McGreevy, vice-president of the Cooney brokerage company, accompanied by other Butte business men, left Oct. 7 for Billings, Mont., to make an inspection of oil properties adjacent to that city. A drill hole was put down about 60 ft. several years ago by ranchmen in that vicinity, who formed a stock company for the purpose. When the hole was drilled to this depth the project was given up, owing to the drill being rendered useless by an accident. Recently the Butte men decided to take up the enterprise and engaged an Oklahoma engineer to examine the field. He stated that conditions are ideal for discovering oil.

Salt Lake City

Oct. 10—Word has been received that the Department of the Interior has denied the application for a rehearing in the case of the East Tintic Consolidated Co., and has upheld the decision of September, 1911, requiring for patent the exposure of "a vein or lode of mineral-bearing rock in place possessing in and of itself a present and prospective value for mining purposes." This construction of the law governing patents is considered by Western mining men to be contrary to all precedent both in the courts and in the Department of the Interior, and is regarded as an instance of the extremes to which the advocates of national conservation of resources will go. It was hoped that the department would see fit to reverse the decision of 1911, and revert to its former interpretation of the law, under which the mining industry has developed and prospered. Under the present ruling, prospecting has been discouraged, and the chances of opening new camps and properties reduced to a minimum. It is probable that the Western mining interests will put their case before Congress, and ask for a new law, which will be practical in its application.

Several Tintic properties have granted an increase of 25c. per day in wages for underground work, making the present

scale for mines operating six days per week: Muckers, $3; miners, $3.25; machine and timber men, $3.50.

The five-mile railroad from Helper through Spring Cañon to the coal properties in Carbon County, belonging to the Knights, is practically completed, and the work of erecting buildings at the camp, and installing machinery, is progressing satisfactorily.

The latest development in the strike situation at Bingham is the resumption of operations at the Utah Consolidated with a force of 50 men, Oct. 9, and at the Utah Copper Co., Oct. 10, with 150 men.

Negaunee, Mich.

Oct. 12—It is announced that the Bureau of Mines will station a mine-rescue car in the Lake Superior district, to serve the iron- and copper-mining regions. It is not known at what place the car will be kept as headquarters, but it will undoubtedly be in Michigan, as the Minnesota mines are largely open pits and not so dangerous as the old range properties. This granting of a rescue car is the result of petitions made to J. A. Holmes during his visit to the Lake Superior Mining Institute, at Houghton, last summer. The increased interest in mine-rescue work on the Michigan iron ranges is directly due to the disastrous fire in the Hartford mine, of the Republic Iron & Steel Co., at Negaunee, early in 1911, when seven men lost their lives. Since that time, several of the larger companies have purchased rescue apparatus and have trained rescue crews. The granting of a rescue car in charge of a Bureau of Mines official will give an added impetus to the policy of preparing for mine fires and cave-ins.

The adoption of the new workingman's-compensation law by the mining companies will make unnecessary the collection of 50c. per month from each man for "club fees." Such funds were used to help miners, when injured, and their families in case of death by accident in the mines. The collections were made through the payroll in the same manner as the doctor's fee of $1 is collected. In the case of the Cleveland-Cliffs Iron Co., when the change was made to come under the Compensation Act, the Club Fund had quite a surplus on hand. An election was then held to determine if this money should be paid out to families of employees dying from natural causes. The employees at all the mines voted upon the question, and the motion was lost. It was decided to pay out the money as in the past, namely, for accidental injuries or to families of employees accidentally killed, limited to employees who were in the employ of the company prior to Sept. 1, 1912, or who have contributed to the fund. Such payments will cease when the fund is exhausted, as no more collections will be made.

Deadwood, S. D.

Oct. 10—That the gold production of the Black Hills district is increasing, is evidenced by the receipts of bullion at the Assay Office, in Deadwood. For the last quarter, ended Sept. 30, 1912, Assayer L. P. Jenkins states that the purchases at this office were $1,988,724. This is larger than any previous quarter during the year, and has only been exceeded once before in the history of the office.

New work in the Black Hills is progressing at a good rate. The Victoria mill, which recently started, is operating steadily and with increased tonnages. The New Reliance plant has resumed, after a suspension during which a number of changes were made, which are expected to increase the facility of treatment. Construction work on the Bismarck mill, at Flatiron, is going forward rapidly, and should be completed this year. Work on the roaster at the Astoria mine of the Golden Reward company is being pushed with a good crew.

Property purchase and increased production are features of late operations at the Homestake. According to a local paper, August was a big month for the mine, as during that time 21 bars of bullion were produced, and all of them were large. That the lower levels of the mine contain deposits of rich ore has long been known, but never in the past has this ore been so extensively drawn upon as during August. This is given as the reason for the heavy production that month. During the last few months the Homestake has added nearly 1000 acres to its holdings along the "Belt" by the purchase of the Hidden Fortune and Columbus properties. The former was taken over a few months ago, and the latter is now being secured as fast as the necessary documents can be signed. The consideration being paid for the Columbus is the taxes and liens, amounting to about $40,000, and five cents on the dollar for the bonds. Outstanding bonds amount to $400,000, so that they will cost $20,000. Inasmuch as the taxes and liens are a prior lien to the bonds, the Homestake's purchase of the latter is more of a formality than a necessity.

A deal has been concluded between the Dakota Power Co. and the Consolidated Power & Light Co., whereby the latter buys all of the former company's surplus power, which at the present time amounts to about 1000 kw. The Consolidated Co. furnishes power and electricity to the mines and cities of the northern Black Hills district, and operates two plants, one water-power plant on the Redwater River, and a steam plant at Pluma. The Dakota Power Co. has recently completed and put in operation a hydro-electric plant, on Rapid Creek, near Pactola. To connect the distributing systems of the two companies will necessitate the construction of 29 miles of line, from Whitewood to Blackhawk. This work will be undertaken immediately.

Wallace, Ida.

Oct. 9—Two more litigations have been started in the Wardner field, making three lawsuits which are now pending. The first was begun when the Bunker Hill & Sullivan Mining & Concentrating Co., started suit against the Caledonia Mining Co., claiming that the apex of the Caledonia vein was on Bunker Hill ground. The Caledonia was forced to stop work. The second suit was started by the Stewart Mining Co., against the Ontario company. This action is also based on the apex rights, the Stewart company claiming the entire Ontario orebody. The action does not, however, affect the Stewart orebody. The work on the Ontario has been conducted through the 5000-ft. Silver King tunnel. The portal, the mill and the ore bins are in Government gulch. Work was begun about one year ago and since then 4000 ft. of development work has been done. A shaft has also been sunk 250 ft. A large amount of galena has been shipped direct besides the product from the 150-ton mill, which has been running at full capacity. Work has been entirely stopped at the property. The third suit to be started is by the Bunker Hill against the Stewart company. This suit is to prevent the latter company from extracting ore from the Saxon claim and to account for the ore already removed. The Saxon claim is owned by the plaintiff. It is claimed that in doing development work the Bunker Hill company broke into the workings of the Stewart on the Saxon ground, the ore from the Saxon being removed through the Stewart new Fir tunnel. The ore in the Saxon was reached through an extension from the Stewart 300-ft. level. The Saxon claim and the Senator Stewart claim, the latter owned by the Stewart, have a common end line. Following the serving of the restraining order, the Stewart removed its men from the disputed territory. This suit, like the one started by the Stewart, does not affect the principal orebody of the Stewart.

Toronto

Oct. 11—An interesting case was heard recently before Chief Justice Falconbridge. David Faskin, a lawyer in Toronto, sued John and Duncan McMartin, Noah Timmins, and David A. Dunlop to recover $600,000 commission which Mr. Faskin claimed was due him for making the sale of La Rose shares in New York, when the amalgamated properties, La Rose, La Rose Extension, Lawson, University, Princess, Fisher, and Epplet were purchased by W. B. Thompson and E. P. Earl, of New York, in 1908. It is said the action was settled out of court, Mr. Faskin receiving $125,000 for his services.

The Mining News

The Current History of Mining

Alaska

Alaska United—During August the Ready Bullion 120-stamp mill was in operation 31 days, crushing 18,648 tons of ore for a recovery of $56,438, which yielded $31,300 net. The yield per ton of ore milled was $3.06. The 700-Ft. Claim 120-stamp mill was in operation 31 days, crushing 20,706 tons of ore for a recovery of $54,030, which yielded $22,-072 net; the yield per ton of ore milled being $2.64.

Houston Dredging Co.—This company has been incorporated with a capital stock of $1,000,000 to carry on a gold-dredging project on Kenai Peninsula. Joseph H. Houston, Seward, and Hiram C. Gill and J. R. Gondolfo, Seattle, are the incorporators. The head office will be in Seattle.

Skeen-Lechnor—A large block of stock from this company has been taken over by Otto R. Hanson, of Milwaukee. A test run has just been completed, and 200 tons of ore put through the mill returned $20 per ton as free gold.

Arizona

Gila County

Old Dominion—A crosscut from the drift on the 16th level has cut the east orebody and has passed through 8 ft. of ore. The crosscut is now in lean iron pyrite, but the hanging wall has not yet been reached and the prospects are considered favorable for finding more ore with this crosscut. Excavation for the new crushing plant is well under way.

Miami—The mine is maintaining an output of about 3000 tons per day, most of which comes from square-set mining next the capping, and from development work. Five shrinkage stopes are in operation. One is worked out and is full of broken ore, two are ready for actual stoping, and two more are being made ready. The capping is already beginning to settle, as is evidenced by large cracks at the surface. A two-compartment raise is being made in a "horse" from the 420-ft. to the 270-ft. level. A Nordberg, 120-hp. electric hoist will be installed on the 270-ft. level for hoisting men and timbers from the 420-ft., or first haulage level, to the levels above. This raise will take the place of No. 2 shaft, which is sunk in the orebody and is already beginning to squeeze from the settling of the capping, and will eventually be abandoned. The company is employing about 1000 men.

Inspiration Consolidated—Railroad construction is going rapidly forward, and it is expected that track will be laid to the mill-site and to the Live Oak tunnel by Jan. 1, 1913, and to the main shafts by Mar. 1. About 225 men are employed and it is stated that there is a scarcity of men and that 75 more could be used. Most of the laborers are Mexicans and Indians. Grading for the yards at Miami is finished; five miles of 75-lb. steel are on the ground, and as soon as the ties arrive, track laying will be started. Bids are being submitted for locomotives and other railroad equipment.

Iron Cap—The east drift on the 650-ft. level has been in ore for the last 80 ft. The average width of the vein is reported to be 5 ft., and the average width of the ore about 2 ft. A stope has been started and is now about 20 ft. long and two sets high. The east drift on the 800-ft. level is in 35 feet.

Arizona Commercial—Work in the shaft has been discontinued, pending the erection of the surface equipment. The steel headframe is up and the hoist and a boiler installed. The hoist will be operated with steam until the electrical equipment arrives.

Southwestern Miami—Churn-drill holes Nos. 4, 7 and 8 are 675, 1095 and 1267 ft. deep, respectively. Holes Nos. 7 and 8 are reported still to be in chalcocite. No progress is being made in them at present, as they are being reamed, after which drilling will be resumed. Final payments on the Roman Eagle Nos. 1 and 2, and on the Pinyon and Jack Pot claims, have now been made to all the owners. The total price was $57,000, but a discount was obtained on account of the final payments being made sooner than called for in the option.

South Live Oak—Churn-drill hole No. 4 is more than 125 ft. deep in schist, carrying small amounts of silicate and carbonate of copper.

Black Warrior—Fisk & Snell, lessees, have started to ship copper-silicate ore to the Old Dominion smeltery, and it is expected that regular shipments will be maintained. The ore is coming from the 100-, 200-, 250- and 300-ft. levels.

Irene—At this mine, two miles north of Globe, a station is being cut in the tunnel, 420 ft. from the portal and a gasoline hoist will be installed for sinking a winze. The two miles of road to the property is finished. J. A. Fleming is in charge.

New State Copper Mining & Smelting Co.—At the annual meeting of the stockholders, Oct. 7, J. N. McDonough was elected president, Harry Sultan, vice-president, Wade Sotel, secretary and treasurer, and Thomas P. Kelly, manager.

California

Nevada County

Oak Flat—Pay gravel has been encountered at a depth of 525 ft. in a raise from the tunnel. The channel measures from 8 to 10 ft. on the rim. Grizzly Ridge Mining Co., owner, also owns the Oustomah, which is improving with development, and the shaft is being unwatered. E. C. Klinker, of Grass Valley, is superintendent.

Bellefontaine—The installation of a five-stamp mill at this mine, near Willow Valley, is contemplated. It would be employed in development. P. C. Drescher, of Sacramento, is owner.

Montana—Electric power has been substituted for water power at this mine in the Nevada City district for hoisting, pumping and the machine drills. Drifts are being extended and the conditions are encouraging for the development of pay ore. Arthur Hodge, of Nevada City, is superintendent.

Deer Creek Placers—Herbert Kitts and others have taken a bond on this land with the idea of installing a dredge. An electric power line has been extended from Woods Ravine to the placers which are three miles west of Grass Valley.

Sierra County

Primrose—Machinery has been taken to this quartz mine, in Hog Cañon, ready for use in early spring; M. L. Morrison, Sierra City, in charge.

Eagle—This gravel property, near Port Wine, and the Arizona adjoining it, are under bond to Bert Davis, who has cleaned out and retimbered the 800-ft. tunnel that was run many years ago for the channel, but never driven far enough. Two shifts are employed and the work will be continued during the winter.

Bear Creek—At this American Hill quartz mine, a new electric hoist is to be installed, and the shaft now being sunk on the vein will be continued.

Kate Hardy—At this Forest mine, 100 ft. of tunnel has been completed on contract, undercutting the shoot from which a pocket was taken some time ago. The erection of a mill next spring is contemplated. W. M. Beggs, of San Jose, is operating the property.

Sierra Standard—The road has been completed to this mine and an auto truck is now in use between the mine and Downieville. Underground work is in progress and will be pursued all winter; J. S. Frye, superintendent.

Alhambra—A new shoot which pans gold freely, has been encountered in this mine, near Poker Flat. A series of quartz veins exists here, inclosed in a massive dike of maraposite, the formation being identical with that of the Red Ledge mine, at Washington, Nevada County.

Fruitvale—The tunnel has been driven on the vein for 700 ft., and at the face a crosscut shows the width of the vein to be nearly 40 ft. The dip gives over 1000 ft. of backs. Three shifts are employed with power drills.

North Fork—At this Forest mine the rebuilding of tunnel house, change-room, powder magazine, timber and machine sheds, storehouse and electric converter building is about complete, and a water system for added protection against future fires is being planned by Manager Stone. A drainage sump has also been completed, the water to be ejected by electrically driven pumps. The force of miners is being increased and extensive underground development is to be pushed.

Colorado

Lake County—Leadville

It is stated that a zinc company recently let a contract to a lessee to ship 1000 tons of zinc ore at a flat rate of $5 per ton for 22% zinc, the highest price yet paid. It is also said that there are thousands of tons of 18% ore available in the district, if it could be shipped at a profit, and that zinc buyers are offering $4 per ton, f.o.b. cars at the mine, but limit the mine to 1000 tons.

Fanny Rawlins—This mine is being thoroughly prospected for zinc ore, a shoot of which was found a few months ago. E. A. Hawkins, lessee.

Eagle Mining & Milling Co.—This company, owning the Iron Mask, on Battle Mountain, Red Cliff, will enlarge the capacity of the mill to 120 tons per day, and new roasters, tables and magnetic separators for treating zinc-lead ore will be installed.

Highland Chief—It is reported that lessees on this Breece Hill property have opened a 3-ft. vein of zinc-carbonate ore in one of the upper levels, and that it is above average value.

Long & Derry—The present output of this property, in Iowa Gulch, is 200 tons of silver-lead ore per month; most of it comes from a level from the bottom of the shaft.

Sugar Loaf Consolidated Co.—The vein in the breast of the tunnel is widening and the output increasing. At present about 25 tons per day is being sent to the smeltery.

Yak Tunnel—This important work, which has practically reclaimed idle mines on Breece, Iron and Carbonate hills, and in Big Evans Gulch, is now in Resurrection ground, three miles from the tunnel portal, and 34 sets of lessees are at work in it, the average tonnage of ore shipped being 12,000 tons monthly. The elimination of the heavy expense of pumping and sinking has enabled many mines to be worked, which could not be operated from the surface when water had to be lifted.

San Juan District

Tomboy—During September, the mill was in operation 28 days, crushing 10,000 tons of ore, which yielded bullion worth $50,500, and concentrates worth $33,500. The expenses of operation were $44,000, and $11,300 was spent on permanent improvement.

Morning Star—A strike in this mine, in Bilk Creek basin, of Mt. Wilson, is reported by W. R. Vandeveer, the superintendent. The mine is at 11,000 ft. elevation, but will eventually be worked through the Sunshine tunnel, which is being driven 670 ft. lower.

Litchfield Mining & Milling Co.—This company has been organized by J. H. Litchfield, of Telluride, to develop the Great Eastern, Utopia, Colonna, and Great Western, in the Bilk Creek basin, above the Morning Star group, the stock being chiefly held in Elmira, N. Y. He will work six men on development all winter. The company owns 6000 ft. on the course of a vein 8 ft. in width, the principal valuable mineral being gold.

Teller County-Cripple Creek

Six Points—A washer is being operated on the dump by E. Moser. As is the case in many of the Cripple Creek mines the mineral is in the so called talc or more properly kaolin, which sticks to the surface of the rock. Chilson & Polly, lessees, ship seven carloads per month of high-grade ore and a 5-hp. electric hoist has been installed in order to sink a winze to prove the depth of the shoot from which the ore is being stoped.

Isabella—In September 83 carloads of ore were shipped from this mine, the royalties being estimated at about $4000 to the company.

Last Dollar—At this mine on Bull Hill, Lessee A. May has opened ore at the 1350-ft. level, reported to be 3½ ft. wide. F. T. Sanders is superintendent.

Idaho

Coeur d'Alene District

Tamarack & Custer Consolidated Mining Co.—The force of miners will be doubled at once, making 60 employed.

Copper King—This company, at Mullan, has started a raise to connect the upper and lower workings. When completed the raise will be 1400 ft. long. It is now up 50 ft. and shows a vein eight feet wide, all of which is good milling ore. The ore is a mixture of galena and copper glance, carrying silver and some gold. A winze has been sunk from the upper workings on an oreshoot which has not been found in the lower tunnel. It is planned to connect the raise and the winze and thus pick up the oreshoot.

Alice—A force of men has been set to work to get the mine in readiness for active operation again. The mine was shut down about three months ago, soon after it had been dewatered. The pumps have been kept in operation, however, since the shut-down. A lease has been obtained on the property. The mill will be in operation in a few days as there is plenty of ore available.

Bunker Hill & Sullivan—The fire which is believed to have claimed one victim, was brought under control, Oct. 8. Rescue crews began immediately a search for F. A. Bentz, a pumpman who remained at his post when the fire broke out, the miners on shift having made their way through the connecting workings to safety. Reports from the searching parties indicate that the gases have filled these workings, and it is extremely doubtful if Bentz will be found alive. The actual fire loss is small and it is expected that the mine will resume operations in a week or ten days.

Idaho County

Golden Scale Mining Co.—This company has completed a successful season's placer run and has suspended operations in order to make a few improvements before winter sets in. The ditch will be extended and other improvements will be made, involving a total expenditure of about $10,000 to facilitate working on a larger scale next season.

North Star—The mill is now running steadily on ores from the Black Diamond mine and Manager Hye has contracted to treat the ores from the Dillinger mine.

Hazlitt—This mill in Olive Gulch is rapidly nearing completion and will probably be in operation in a short time.

Frisco Mine—Work has been resumed on this property under the direction of E. J. Comly. The crosscut tunnel will be driven 250 ft. further to cut the vein at a depth of 500 ft. Drifting on the vein will then be started.

Michigan

Copper

Keweenaw—This company will start drilling along the trend of the Ash-bed lode as soon as General Manager Uren completes all the plans.

Houghton Copper—The winze started from the 620-ft. level is down about 200 ft., and will soon be bottomed, when it is planned to develop the lode tributary to this winze with lateral openings. Developments at the 620-ft. level continue satisfactory and a stockpile is being accumulated to carry a large quantity of commercial ore.

Hancock—This company's vertical shaft is nearing a depth of 4000 ft., at which depth sinking will be discontinued and attention be given to the development of the lodes. The property is in such shape that this work can go forward rapidly, and in a comparatively short time the property can be put on a permanently producing basis, the surface equipment being as complete as any in the district.

Isle Royale—Trenching has been started at another place to reveal the outcrop of the lode that was cut in drilling. The first trench revealed the lode in a favorable condition, and its further development will be watched with interest, as it is believed that the lode exposed is the southern extension of the Kearsarge.

Iron

Buffalo Iron Mining Co.—This company has been formed as a subsidiary of the Wickwire Mining Co. to operate the Donohue and McGovern properties, at Iron River, recently taken over from the Niagara Iron Mining Co.

McGreevy Steel Co.—This corporation has been formed to operate in the Iron River district. The holdings of the McGreevy Iron Co. have been taken over, including the LeRoy property, on Sec. 29, 43-34, and the Boyington property, on Sec. 13, 43-34. Also the Buckholtz mine, of the Iron River Ore Co. has been taken over, and the Purcell property, north of town, recently secured by Paul Chamberlain and associates. The old Sheridan mine has been secured by lease from Alexander MacKinnon. It is planned to unwater the Sheridan mine and sink the shaft several hundred feet deeper. This mine was shut down, 12 years ago, after producing 116,000 tons of ore from comparatively shallow levels. The mine was troubled at that time by burning of the sulphur in the ore upon exposure to the air. At the Purcell property, a shaft will be sunk, and the small orebody, known to exist, will be mined as quickly as possible. The Le Roy and Boyington properties are yet in the exploration stage. Diamond drilling has been carried on at the former during the last summer. The company is capitalized at $500,000, and is incorporated under the laws of the State of Utah.

Republic Iron & Steel Co.—This company has issued a call for 200 men for its Hartford, Cambria, and Lillie mines, at Negaunee. John Deacon is in charge.

Warner—A new headframe is being erected at this Pickands, Mather & Co. property, in the Amasa district.

Heidelbach—Diamond drilling on this Cascade Range exploration has been stopped. The results have not been made public.

Florence Iron Co.—Two electrical, belt-driven air compressors, each of a capacity of 1500 cu.ft. per min., have been purchased from the Ingersoll-Rand Co. One is for the Bates mine, at Iron River, the other for the Ernst mine, at Commonwealth, Wis. A drill sharpener has also been purchased from the same company.

American—The new iron-ore concentrator has been started in operation.

Saginaw County

Saginaw Valley Development Co.—Oil has been struck in Saginaw by this company at a point where testing has been recommended by the state geological survey for the last 11 years, at a depth of 2317 ft. It is said that the oil stands 1200 ft. deep in the well and will probably yield about 25 bbl. per day. It is a light-colored, high-grade oil.

Minnesota

Mesabi Range

Oliver Iron Mining Co.—The employees of this company's mines at Virginia have organized a first-aid team, one of the first on the range. The officers are: Claude Gill, president; Herman T. Reifel, vice-president; and J. E. Biron, secretary.

Missouri

Joplin District

About 3000 ft. of drilling has been contracted for on a 40-acre lease of the Cobble land south of the Sitting Bull mine at Thoms Station. The first hole has been sunk 200 ft. and good chippings obtained.

The zinc smeltery at Nevada, Mo., is to be closed down. Transportation difficulties and the high price of ore are assigned as reasons. The plant may resume operations in the spring.

A 500-ton mill is to be erected in the South Carthage field by the Ramage interests. The ground was thoroughly drilled and two runs of ore developed.

Gouverneur—This old mine on the Excelsior land at Four Corners is to be worked by Winsor & Co. The mill is in good condition and can be easily repaired. Because of the pockety character of the ore former operators have not been successful in this region; small operations paying better than those on a large scale.

Brown Mining Co.—A 12-ft. stope is being taken up by Ritter & Allen on a lease of this property. The ore occurs in seams in blue chert, soft ground, and is hoisted and milled on an adjoining lease.

Mineral King. No. 2—A derrick has been erected on a new shaft in the Riselling land west of Joplin. The mine is to be known as the Mineral King No. 2, and as soon as the shaft is completed and drifts opened up, a concentrating plant will be built.

Mohawk Mining Co.—Four drifts with high faces of ore have been opened in this Mohawk shaft. It is estimated that the ore will produce 20% concentrates.

Wilson Mining Co.—This company, operating on the Boston-Duenweg land at Duenweg, has built a sludge mill equipped with three tables, one of which is of new design. This table has a center discharge and valve draw-offs similar to a jig; the valve draw-offs being necessary because of the table carrying a one-inch bed. The sludge is delivered to the mill through a revolving dewatering screen.

Montana

Butte District

Butte & Superior—Work was started Oct. 5, on the concrete foundation for the new Nordberg hoisting engine, to be erected at the Black Rock mine. The old engine which, prior to its purchase by this company, was used at the Drum Lummon mine, at Marysville, has been found inadequate to handle the largely increased output of ore which development during the last year has produced. A new steel headframe is also under construction, and a skip-changing device similar to that in use at some of the Anaconda company mines, is being installed. The skip can be detached from the cable, and three- or four-deck cages be attached in its place in less than five minutes. The chippy, or auxiliary cage, is being operated while the main hoist is being changed, a small temporary headframe having been erected for the purpose. This cage is used for lowering the miners, timber and supplies, and in addition it hoists about 120 tons of ore per day. During the shutdown the stockpile is being utilized to furnish, with the ore hoisted, a total of 400 tons of ore per day, the amount which the mill is now handling. The work of making needed changes upon the other half of the mill is continuing steadily, and it is believed that by the first of the year it will be running smoothly at full capacity.

Fergus County

Gold Acres—This property, adjacent to the New Year mine, situated near Maiden, has been bonded to the Rheingold Mining Co., composed of Chicago men. N. J.

Littlejohn, of Lewiston, is in charge. Recently the Rheingold company completed a mill at the New Year property, and ore from the Gold Acres mine will be treated there.

JEFFERSON COUNTY

Mount Washington—John D. Pope and George W. Wilson, of Butte, who are operating this property, in the Wickes district, are making regular shipments of ore to the East Helena smeltery. During September they shipped 200 tons of silver-lead ore. A shaft is down 200 ft., and drifting has been done on the 100- and 200-ft. levels. The ore now being shipped is stoped above the 100-ft. level.

Calumet & Montana Mining Co.—A strike of good ore was recently made at the King Solomon property, near Clancy. During the last year new machinery has been installed, the shaft sunk deeper, and extensive development work done.

LEWIS & CLARK COUNTY

John Larson, who owns a property near the Bald Butte, has bonded it to Colorado men. They have pumped out the shaft, and are preparing to deepen it.

Four mines are being operated in the Marysville district, two of which, the Thomas Cruse properties and the Bald Butte company's mine, are paying. In addition the Barnes-King Development Co. is operating a property lately acquired, and the St. Louis Mining Co. is preparing to add a cyanide plant to its mill.

Bald Butte—The mill is running night and day upon ore being mined from a raise on the 600-ft. level. The ore is of excellent grade.

Nevada

COMSTOCK LODE

Mexican—The new incline winze on the 2500-ft. level has been started and is 15 ft. deep. The winze is at the north end of the stope, in solid ground. It will follow the foot wall of the vein, which dips about 20° to the east. Cutting out for the sheaves for a hoist over the winze has been completed. At the mill, an additional tube mill has arrived and is being installed upon the foundations prepared when the plant was built. This will give the plant two tube mills for regular service and will increase the daily capacity about 25 tons per day to a total of 110 to 115 tons; 14 bars of bullion have been shipped to the smelter since the first of the month.

Sierra Nevada—A north drift has been started from the south boundary of the mine, and 25 ft. in encountered the east vein. It is a strong vein, but the assays in the quartz are low. This drift will penetrate virgin ground.

Consolidated Virginia—In the northeast drift on the 2300-ft. level, a west crosscut has been started driving for the foot wall of the main Comstock vein. The drift has encountered a fracture that contains a streak of promising quartz. The strike is toward the west, and is making into a big block of hitherto unopened ground. An effort was made to open this territory by Mackay and Fair, but was unsuccessful because a hot-water belt was struck. New pumps, recently installed in the shaft will easily handle this water now, and exploration in that direction will be pushed ahead.

Ophir—The new cyanide plant is now nearing completion, the pipe connections, etc., being made, and other finishing touches added. It is stated that the mill will be in operation by the last of October. Work has been resumed on the 2500-ft. level of the mine, driving east and south for the vein.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Oct. 5, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,550	133,969
Tonopah Belmont	3,431	94,931
Montana-Tonopah	1,069	41,369
Tonopah Extension	1,045	39,936
West End	975	30,122
Midway	50	570
MacNamara	469	14,619
North Star	.....	170
Mizpah Extension	.....	40
Jim Butler	300	2,200
Totals	10,889	357,926
Estimated value	$272,225	

Tonopah-Belmont—A winze is being sunk on the oreshoot from the 13th level, it having now been drifted on for 300 ft. The vein is from 25 to 30 ft. wide on this level.

Tonopah-Merger—The west drift on the 980-ft. level has been extended 85 ft. into the oreshoot, the last 15 ft. showing six feet of ore. Shipments will be made to the old Belmont mill.

North Star—The new vein on the 1250-ft. level shows improvement in both drift and winze and good assays are again obtaining. On the 850-ft. level the ore has widened to four feet.

Tonopah Extension—The vein on the 660-ft. level in the extreme western workings is from 8 to 10 ft. wide of good milling grade.

MacNamara—The net profits for September amounted to $16,800.

Tonopah Empire Mining Co.—This company has been incorporated with a capital of 1,500,000 shares of $1 each to develop six patented claims adjoining the Merger mine. The directors are Seeley W. Mudd and Frank A. Keith, of Los Angeles, John G. Kirchen and Key Pittman, of Tonopah, and Max E. Bernheimer, president, Tonopah Extension Mining Co.

New Mexico

SOCCORO COUNTY

Socorro Mines—All the development headings in the lower levels are in ore and the two lowest, the 700 and 800, show especially good ore. The mill is running steadily and crushed between 4000 and 5000 tons during September.

Mogollon Gold & Copper Co.—An electric hoist will be installed over the winze in the Little Charlie tunnel, which continues to yield a good tonnage of high-grade mill ore.

Ernestine Mining Co.—Production for September was 25,500 oz. of gold and silver bullion and 20,000 lb. of high-grade concentrate. The usual monthly dividend of 1% was declared Oct. 1.

Deadwood Mines—September production exceeded any month to date. Development in the 500, the lowest level, is exposing a good grade of ore four to seven feet wide.

Oaks Co.—During the month 420 tons of ore of an average value of $17 per ton was shipped from development work.

South Dakota

LAWRENCE COUNTY

New Reliance—The plant at this property has been started. During the time operations were suspended a Portland filter was installed. The mill contains 30 stamps; and the ore makes a large proportion of slime, and in the past the slime department has been a weak spot. F. C. Bowman, Trojan, is manager.

Deadwood-Homestake—This company has been reorganized and has taken over the Montezuma and Whizzers, and the Garfield properties. The property lies east and north of the Homestake, and a deep shaft will be sunk in an endeavor to find that orebody. Funds are being raised to sink 1000 ft. C. E. McHugh, Deadwood, is manager.

Black Hills Standard—Mill operations have been suspended for the winter, after a fairly satisfactory run on ore from the Deadwood Standard mine. Officials state that work will be resumed in the spring.

Wasp No. 2—Steam-shovel stripping will soon be suspended for the winter at this property. The shovel has been used on the north side of the open cut, and has 35,000 tons, or a four months' supply for that portion of the mine, now stripped.

Bismarck—The mill building has been completed and inclosed, the tanks erected, and as fast as the rest of the equipment arrives, it will be installed. This should require only a few weeks. F. B. Hitchings, Deadwood, is manager.

Kiemer—The long crosscut tunnel has intersected the vein and drifting easterly is now in progress. Less than 100 ft. will take the workings to a point imme-

diately below important surface showings, and where it is expected that good ore will be found.

Heidelberg—Work at this property on Two Bit, is showing further oreshoots. Local men who recently made an examination, got excellent returns, and will probably become interested. The property is in an almost unknown part of the Black Hills. Treber & Bros. Deadwood, are owners.

Hailstorm—Louis Arpino and associates have leased this property, in Strawberry gulch, from the owners, Mrs. C. E. Zipp, Frank Viox and others. The property contains a small seam of high-grade smelting ore.

Monarch—Walter Nickoli, who is leasing on this property, is making regular shipments of ore to smelteries. The oreshoot is small, but good for leasing work.

Wells Fargo—Lessees on this property, belonging to the Golden Reward, and which had been idle for 15 years, are doing well, shipping milling ore to the Golden Reward plant at Deadwood, and higher-grade ore to the Denver smeltery.

Minnesota — Judgments and taxes, amounting to a little over $20,000 have been paid, and work is expected to be resumed at an early date. Former President, F. E. Little, is negotiating for an option, and states that he and associates are prepared to start work immediately if they can secure the ground under favorable terms.

Utah

Beaver County

Moscow—Shipments of silver-lead ores are being made at the rate of one car every two days. A new strike of good ore is reported on the lower levels.

Cedar Talisman—A contract for 200 ft. of work has been let to Tom Campbell, an old Beaver County mining man. This will consist of driving on the 500-ft. level for the Stalwart fissure and west contact.

Majestic—During September 45 cars of copper-iron ore were shipped from the Hickory, and two cars from the Harrington. This is one of the best months the property has had, and it is in good shape for the continued production.

Tot Eiler Gold—This property is in the Newton district, adjoining the Rob Roy on the southwest, and the claims cover placer ground. A tunnel has encountered loose gravel, most of which will pan, and some of which is reported to run $1.60 and upward in gold. This was cut at the 150-ft. point, and was followed 25 feet.

Juab County

Tintic shipments for the week ended Oct. 4 amounted to 208 cars, made by 22 different properties, including leases, which shows the large number of properties active in this camp.

Eagle & Blue Bell—During October production will be largely increased, and the management expects to average 100 tons of ore daily. At the annual meeting held Oct. 5, the following directors were elected: James P. Graves; H. N. Sweet, F. R. Sands, F. H. Williams, G. E. Davis, Imer Pett and Duncan MacVichie. Reports submitted regarding the work done and results obtained during the last year showed it to have been one of the most satisfactory in the history of the company. Winzes were driven below the 1000-ft. level, opening good quantities of shipping ore. In order to handle these to better advantage, the shaft was sunk from the 1000 to the 1350-ft. level, and a crosscut and raise driven on the 1350, to connect with the stopes above. New ore chutes and new ore bins have been installed, and the equipment generally put in good condition. Financial statements covering the last year's operations will shortly be sent to stockholders. The control is held by the Bingham Mines Co., owned by Boston men chiefly.

Swansea—The north face on the 940-ft. level is reported to be back in the vein again, and shipments from this place are expected.

Gold Chain—Operations are being carried on through the 1500-ft. level of the Lower Mammoth shaft, which corresponds to the 1700-ft. level of the Gold Chain. Work is being done on the vein, and ore has been opened.

Bullion Beck—Shipments are being made from some of the dumps at this property, and about 2000 tons have been marketed. The dump contains approximately 18,000 tons.

Iron Blossom—Eighty tons of high-grade silver ore was shipped recently from the No. 3 workings. The new machinery at the No. 1 workings is being put rapidly in shape, and is expected to be ready for operation early in November. This consists of a new hoist and other equipment. Steel has been ordered for a 60-ft. headframe.

Crown Point—After prospecting on the 500 level, work has been resumed in the shaft, which is 535 ft. deep. Crosscutting will probably be done on the 600-ft. level.

Yankee—Regular shipments of zinc ore are being made.

Dragon—Lessees made up a shipment for the week ended Oct. 4.

Grand Central—Driving and crosscutting is being done on the 2300-ft. level, which is one of the deepest in the district. The vein in some places is as much as 20 ft. between walls, and some ore has been found. It is planned to sink winzes on the vein.

Lower Mammoth—During September this company, for the first time in five years, made expenses. Shipments of lead, copper, and zinc ores are being made, and more ore is being opened. Some profit is expected for October.

Salt Lake County

Alta Consolidated—Funds for development work and payments due on the purchase price of the property have been provided by the sale of treasury stock. M. J. Dailey has been made general manager.

Cardiff—Five faces of ore are reported, and about 100 tons of ore of good grade are being shipped monthly.

Michigan-Utah — Leases have been granted on new ground, and lessees who have been operating on the City Rocks side are mining ore.

Summit County

Park City shipments for September amounted to 6412 tons, valued at about $260,000. The Silver King Coalition shipped 2389 tons, the Daly West, 1461 tons; Daly-Judge, 1781 tons. The remaining shippers were the Grasselli Co., E. J. Baggs, New York Bonanza, Silver King Consolidated, Frank Daley, Chas. Moore, Little Bell, Barry-Coxe, and Ontario lease.

Washington

Ferry County

McLaughlin—Rich ore has recently been encountered on this property near Orient.

Anaconda Gold Mining & Reduction Co.—This company has been formed by the consolidation of the Anaconda Gold Mining Co. and the Republic-Colfax Mining & Milling Co., and extensive operations will be carried on at the different claims in the Republic district. The new company is capitalized at $2,000,000.

Okanogan County

Gold Axe—John Berquist, Chesaw, owner of this property, announces that it is to be equipped with machinery in the near future.

Stevens County

Superior Copper—This mine has been leased for three years to J. B. Sullivan and associates of Chewelah. The new owners expect to begin shipments within two months.

Canada

Ontario

At Cordova, in eastern Ontario, the old Belmont gold mine is being opened by P. A. Kirkegaard. The property has been renamed the "Cordova," and it is expected that the 30-stamp mill will soon be running at a capacity of about 100 tons per day.

Dane Copper Mining Co.—A car of ore which this company recently shipped to the Copper Cliff smeltery, averaged 15½% copper. Diamond-drill explorations have been started.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Oct. 11, and for the year to date, were:

Bailey	.....	21.57
Beaver	.....	299.38
Buffalo	32.82	959.20
Casey Cobalt	43.00	255.15
City of Cobalt	.....	887.99
Cobalt Lake	32.60	716.05
Cobalt Townsite	41.20	1,426.15
Chamb.-Ferland	.....	362.33
Coniagas	.....	1,673.95
Crown Reserve	.....	368.66
Drummond	.....	383.05
Hudson Bay	.....	538.47
Kerr Lake	30.55	590.77
La Rose	74.50	2,807.38
Lost and Found	.....	15.00
McKinley-Darragh	72.79	2,036.57
Nipissing	.....	1,704.50
O'Brien	.....	496.54
Penn.-Canadian	.....	29.70
Provincial	.....	22.22
Right of Way	.....	242.82
Timiskaming	29.95	893.71
Trethewey	66.25	447.79
Wettlaufer	20.19	285.93
Colonial	.....	63.14
Dominion Reduction Co	.....	56.64
Totals	443.85	17,584.66

Nipissing—Development on the Meyer vein has been satisfactory. The picking up of several branch veins has added to the known ore reserves. The fourth level is now being cut on this, the largest of the Nipissing veins, at the 300-ft. level. The low-grade mill is expected to be in operation about Nov. 1. All the machinery is in the mill, and the aërial tramways from the various shafts are being completed.

Timagami Reserves Mines, Ltd.—The assets of the Floyds Silver Mines company have been sold to this company.

ONTARIO-PORCUPINE

Porcupine Southern—Diamond drilling is expected to commence on this property this week.

Kenora—This property is to be reopened shortly.

Pearl Lake—The crosscut at the 400-ft. level shows 8 ft. of $10 ore.

McEnaney—This property, belonging to the Crown Reserve of Cobalt, is showing up well on development. On the 100-ft. level, the ore chute is 200 ft. long, on the 200-ft. level, 450 ft. long and on the 300-ft. level it has been developed for 250 ft. The shaft will soon reach the 400-ft. level. The orebody will average 42 in. in width with a gold content of $28 per ton.

Hollinger—This company has commenced the payment of dividends, the first to be made Nov. 2 to stockholders of record Oct. 25. The initial payments will be at the rate of 3% every four weeks or 39% per year.

Vipond—The oreshoots on the Davidson and Godfrey veins are being opened up on the 300-ft. level and show improvement in width and assay.

Plenaurum—There has been some talk of this company and the Jupiter amalgamating, but neither of these mines is sufficiently developed to warrant any deal of this kind.

Moneta—This property, upon which considerable exploration work has been done, is closed down.

Lucky Cross—Excavations for the foundations of a mill have been completed. Amalgamation and concentration is the practice to be followed at present, with the addition of a cyanide plant later.

Calvert—This company, composed chiefly of Buffalo men, will begin development on six claims which show several good veins on the surface carrying free gold. W. G. A. Woods is managing director.

Mexico

GUERRERO

Reforma Mining & Milling—Inability to get coke, due to repeated interruptions of traffic on the Cuernavaca line of the National Rys., and generally disturbed conditions in Guerrero, forced this company to shut down. Much work has been done on the railroad that will give the mines and smeltery connection with the shipping station on the Balsas River.

Suriana Mining & Smelting—This company has been idle since early in the year, when Manager Robinson killed a rebel leader, and all foreigners were forced to abandon the camp. The company was earning a good profit at the time of the shut-down.

JALISCO

Amparo—Production so far this year has averaged 140,000 pesos per month, and expenses 70,000 pesos. The company is paying 1% per month on a capital of $2,000,000. This year's showing will be much better than that of 1911, due to the fact that interruption in the power service of the Chapala Hydro-Electric Co. seriously interfered with operations last year. There have been few interruptions this year. In November, 1911, the Amparo began the shrinkage system of stoping, and by August, 1912, the reserve of broken ore in the stopes amounted to 54,000 tons. The system is being continued, and under it the reserve will be maintained. It is resulting in a material reduction in mining costs. A 200-hp. Ingersoll-Rand compressor has been put in at No. 2 shaft, which has three compartments and is the main shaft. It is down 1120 ft., and it will be extended to 1200 ft. soon.

Espada—This company is milling 100 tons daily at the Virginia & Mexico reduction plant, in the Hostotipaquillo district, which it took under lease at the beginning of the year. Concentrates and bullion are shipped regularly, and the value of the products sold so far has been 100,000 pesos. The company spent 30,000 pesos in putting the plant in shape for operation at present capacity.

PUEBLA

Puebla Smelting & Refining Co.—This company owns 1400 acres of mineral land near Magistral, 15 km. from Concepcion on the Teziutlan branch of the Inter-Oceanic Ry. According to a report by H. L. Swain, of Mexico City, there are 81,800 tons of dump ores, and 260,000 of partially developed ore in the mine, the average assay of which is gold, 1 gram; silver, 75 grams; and copper 2½%. A smeltery of 1000 tons daily capacity will be built. The first unit of the equipment, 500 tons, is now at the railroad station in Mexico, and the second unit will be shipped before the first is erected. Both reverberatory furnaces and blast furnaces will be used. Charles Q. Davis, president and general manager.

ZACATECAS

Mezquital Mining Co.—This company, capital $1,000,000, has been formed by the Philadelphia men who recently made a deal with the San Carlos Gold Mines, Ltd., of London, for the Mezquital del Oro mines and reduction plant. The 50-stamp mill and cyanide plant, built by the former English owners, are being overhauled, and it is expected that milling will be started late in November. There is much low-grade ore available, and 200 tons daily will be treated. Tests have shown a high extraction without fine grinding.

South America

COLOMBIA

El Recreo—This mine, situated in the Department of Tolima, in the central cordillera of Colombia, produced about 860 oz. of bullion from 1244 tons of ore, taken out in development from Sept. 1, 1911, to Aug. 31, 1912. The wooden stamp mill of nine stamps worked in all 354 days, and crushed therefore roughly four tons per day of 24 hr. All the gold was saved on the plates, no inside amalgamation being possible on account of the wooden mortars. The gold won is of very good quality, netting about $19.20 per oz. The tailings are carefully saved and stored for future treatment. J. F. Dierolf and associates, the owners, expect to have the mine sufficiently developed in another two years, to warrant the erection of a modern plant.

Africa

TRANSVAAL

Gold production in the Transvaal in September is reported at 747,893 oz. This is 16,844 oz. less than in August, the difference being due to the shorter month; the average daily production was 24,930 oz. in September and 24,669 oz. in August. For the nine months ended Sept. 30 the total was 6,099,442 oz. in 1911, and 6,824,875 oz.—or $141,070,166—in 1912; an increase of 725,433 oz., or 11.9%, this year.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Oct. 16—Coal trade in the West is in unchanged condition, with heavy demand, and with slow deliveries. The seaboard bituminous trade is also strong. Car shortage and labor troubles are limiting supplies for local and coastwise trade. Current prices are the highest known for several years.

In the anthracite trade the companies are gradually making up for the shortage of last spring; but the process is a slow one, and there is an urgent demand for supplies, which dealers find it hard to meet, so that deliveries to consumers are slow.

Coal passing through Sault Ste. Marie canals, season to Oct. 1. short tons:

	1911	1912	Changes
Anthracite	1,485,087	1,321,452	D. 163,635
Bituminous	10,079,890	9,544,129	D. 535,761
Total	11,564,977	10,865,581	D. 699,396

There were decreases of 11% in anthracite, and of 6% in bituminous coal.

German Coal Production—Coal production of German Empire eight months ended Aug. 31, metric tons:

	1911	1912	Changes
Coal	106,176,645	116,395,324	I. 10,218,679
Brown coal	46,897,544	52,880,655	I. 5,983,111
Total coal	153,074,189	169,275,979	I. 16,201,790
Coke made	16,647,726	18,688,125	I. 2,040,399
Briquettes m'de	14,058,090	15,834,316	I. 1,776,226

Of the briquettes reported this year 12,363,471 tons were made of brown coal or lignite.

Iron Trade Review

New York, Oct. 16—The iron and steel market has grown more and more excited, and steel producers are giving serious attention to means for curbing the excitement, since it bodes ill for the stability of the trade in the long run. As the mills have fallen farther behind in deliveries, buyers have been piling orders and specifications upon them, until some of them find themselves sold up almost to the middle of next year, based on specifications already in hand and a conservative estimate of specifications to be received if buyers continue at their present rate. While the mills have been optimistic as to the country's probable requirements in steel they cannot in the present peculiar circumstances avoid the conclusion that some of the business is of a partly speculative character and would be canceled should the market take a downward turn. One at least of the largest steel producers has taken a definite stand against accepting any more business, unless in exceptional cases, and this is following a policy which the Steel Corporation has practiced for several weeks in some of its departments.

The most erratic market in the iron and steel group has been Connellsville coke. Prompt furnace coke has sold readily at $3.50 at ovens, which is just double the price some furnaces are paying for current supplies, upon contracts made last November for the year. It is openly charged that some of the operators are neglecting their contract obligations to sell prompt coke at fancy prices, and thus to an extent blast furnaces are buying their own coke at advances ranging up to 100%. Many of the furnaces have sent representatives to the Connellsville region to secure information as to where shipments are going.

The scarcity of unfinished steel has become more acute, and there is practically no steel being offered. While Eastern mills are selling in a limited way for first quarter, the Central Western mills are refusing to sell billets or sheet bars for first quarter, representing that with the tonnage of such steel they must carry over, and the requirements of their own finishing mills, they will have no steel to spare. One large seller of sheet bars which has a number of long-term contracts has notified the holders of those of the contracts which expire Jan. 1 that they cannot be renewed. There is a definite prospect that some finishing mills dependent upon outside sources for steel, and particularly sheet mills, will not be able to run at capacity during the first quarter. These mills are not selling sheets for the quarter, while some of the other mills have been free sellers.

Pig iron continues active, with large orders for both foundry and steel-making irons, especially for basic pig. Higher prices asked by furnaces do not seem to check the demand. Coke is an important factor in the pig-iron market just now, its rapid advance in price affecting the makers. The short supply is keeping some furnaces from going into blast.

Scarcity of labor is a source of complaint from several quarters. It is reported that the Gary works have suffered a considerable loss of labor, which is due to the war just breaking out in the Balkans. A number of Slavs, Rumanians and other men from Southern Europe have left to take part in the war.

Steel Corporation Orders—The United States Steel Corporation reports the total unfilled orders on its books Sept. 30 at 6,551,507 tons. This is an increase of 388,132 tons over Aug. 31, and is the largest quantity reported since June 30, 1907, when the total was 7,603,878 tons.

Baltimore

Oct. 14—Exports for the week included 253,277 lb. nails and wire and 2,165,255 lb. billets and sheet bars to Liverpool; 39,312 lb. nails and 104,000 lb. pipe to Belfast. Imports included 1312 tons manganese ore from Liverpool; 7500 tons manganese ore from Poti, Russia; 5800 tons manganese ore from Bombay, India; 4592 tons pyrites from Huelva, Spain; 17,000 tons iron ore from Cuba.

Birmingham

Oct. 14—While the sales of pig iron in Southern territory during the past week have not been as active as for several weeks previous, there is not the least doubt as to the strength of the market. Sales for immediate delivery as well as during the first quarter of the coming year are on a basis of $14 per ton, No. 2 foundry, with an inclination toward a higher basis. There is no anxiety to sell for delivery during the second quarter of the coming year, the manufacturers feeling confident there is plenty of time and that prices and other conditions will be more opportune. The make in the South is being held up as much as possible. The blowing in of two blast furnaces has been scheduled for this month. The accumulated stock of iron has dwindled down to about 25,000 tons and manufacturers will shortly be in a position of having to depend on the probable make. Deliveries are now steadier than they have been, the railroads handling iron and steel more promptly. The car shortage is felt mainly in the coal-mining section.

The home consumption of pig iron is good. Cast-iron pipe is being manufactured on a large scale. Good prices obtain for cast-iron pipe, $25 down being the quotation.

The steel market is strong with all shapes in demand. Charcoal iron sells right along with $22 per ton as the price. Foundries and machine shops report an improvement in conditions. Scrap iron is also in good demand.

Chicago

Oct. 15—The iron market continues to be one of great activity as regards finished products. For pig iron the de

mand is steady but not large, sales being of small lots—up to 1500 tons—and there are indications that this condition will continue until after election. Melters are buying with something of their old-time caution, in small but frequent purchases, and the furnace agents profess satisfaction with this policy, in view of the continued favorable outlook for the consumption of iron and steel products and with advancing prices.

In general, prices are 50c. higher than last week, though there is a wide range in Southern pig iron, No. 2 foundry being sold at $13.50@14.50, Birmingham, which means $17.85@18.85, Chicago. Probably little is being sold or is obtainable at the lowest figure quoted, $14 or more being obtained on all but odd lots for last-quarter delivery. The furnaces are well sold up into the first quarter and are contracting for first-half needs generally, with an occasional inquiry about business extending beyond July 1, but no sales as yet. Northern iron is strong at $17.50 at furnace, which means about $18 delivered. In general no difference in price is being made between first-quarter and first-half deliveries. Lake Superior charcoal iron is firm and in good demand at $19@19.50 per ton.

Sales of railroad materials continue to be heavy and are being freely made for first-half delivery. Structural material has a large sale for local and Western uses and there continues to be difficulty in obtaining it for first-half needs. Bars are in heavy demand, soft steel selling at 1.58c. and iron bars at 1.50c., with local mills unable to produce enough to meet the demand. Sheets and plates likewise show a crowding of mills and minor lines are greatly in demand. There is no need of actively seeking business in these lines; it pours in from all sides.

Cleveland

Oct. 14—Iron-ore shipments continue heavy, and vessels are in good supply. Movement from the docks is slower, cars being a little scarce.

Pig Iron—Business is active and prices are going up again. Present quotations, Cleveland delivery, are $17.65@17.90 for bessemer, $16.25@16.75 for No. 2 foundry and $19.25@19.75 for Lake Superior charcoal. Basic iron is in demand.

Finished Material—Structural steel is in demand and some large contracts have been closed. Bars are very active and plates are still called for at advancing prices.

Philadelphia

Oct. 16—Several eastern Pennsylvania furnaces have advanced prices for pig iron during the rest of the year and for next year, the later delivery being at an advance of 50c. Contracts have been placed within a few days covering several thousands of tons low-phosphorus silicon, basic, forge and foundry. The foundry buyers are extremely cautious, while the basic buyers are crowding inquiries on an oversold market. Interest is now centering upon deliveries for the first half of next year. Increased output is interfered with by the cost of labor and coke. Numerous inquiries have been received within two days from New England, New York and New Jersey territory, notwithstanding quotations are at the outside limit. Offers of Southern iron are more frequent than two or three weeks ago. The mill demand for forge is still satisfactory. Consumers generally are more anxious than they ever have been to cover work that they feel is assured to them even as late as early summer. Best No. 2 X foundry is quoted at $17.75, basic $17, forge $16.75 per ton.

Steel Billets—Billets have advanced fully 50c. a ton, but this does not refer to premium prices that control nearly all recent transactions.

Bars—Bars have advanced in sympathy with Western advances and some heavy car-building orders have taken three or four mills out of the market for some time to come. Jobbing demand has become very brisk and the general retail demand has sharply improved.

Sheets—All kinds of sheets have been advanced from $1 to $2 a ton, but even with this advance premium prices are freely paid for special accommodations among the smaller consumers.

Plates—The condition of the Eastern plate market is best indicated by some urgent inquiries from Western sources seeking supplies for 30, 60 and 90 days delivery, owing to the oversold condition of Western mills. The latest inquiries from New York and farther Eastern sources show large and urgent requirements which the mills will hardly be able to handle on the terms that are specified as to delivery. The shipyard interests are taking time by the forelock and have placed a few large orders.

Structural Material—A large amount of business has been sent to the mills. Mill managements are straining every effort to accommodate incoming buyers but the volume of work is a little beyond mill capacity.

Scrap—The scrap market is bare of heavy melting steel; in fact, buyers are able to secure only a small portion of material needed.

Pittsburgh

Oct. 15—Effective Oct. 10 the Jones & Laughlin Steel Co. advanced its prices on wire products $1 a ton, to a basis of $1.75 for nails. The majority of the other producers now refuse to admit that they have correspondingly advanced their prices, yet it is learned from other sources that it is practically impossible to buy at less than the higher basis. There seems to be an effort to avoid the appearance of concerted action. Under date of Oct. 12 the American Steel & Wire Co. advanced its differential for galvanizing plain and barb wire, etc., from 30c. to 40c. per 100 lb. and this advance, which is due to the high price of spelter, is being generally quoted.

The local iron and steel market shows no material change from a week ago except for the advance in coke and the greater pressure upon the mills by way of buying and specifying. None of the mills seem to be receiving less tonnage than they are shipping, and as a rule they are getting more than they are shipping, so that they are falling farther behind. Barring accidents, the majority of the chief branches of the industry will be able to run full into the second quarter. Pipe and wire are not customarily sold so far ahead, but even in these lines there is a very heavy tonnage on books.

Prices of 1.35c. on bars and of 1.45c. on plates and shapes have disappeared. While the mills do not all admit that they have withdrawn the minimum quotations, it is known that they have, and that bars cannot be bought at less than 1.40c., or plates and shapes at less than 1.50c. Lately some of the mills have shown a disposition to name lower prices to trade publications than they quote to their customers, which is distinctly a new development, though whether this is due to business or political conditions it might be difficult to determine.

The Jones & Laughlin advance of $1 a ton in wire products placed nails at $1.75 per keg base, and plain wire at 1.55c., base. The advance of the American Steel & Wire Co. of Oct. 12 in galvanizing, from 30 to 40c. per 100 lb., makes galvanized wire 1.95c., while galvanized barb wire is 2.15c., painted being 1.75c. These prices, based on $1 a ton advance in the base rates, are quotable as the market although some of the mills have made no official announcement.

Pig Iron—Late last week a steel interest purchased 14,000 tons of basic iron, chiefly for the early months of next year, on the basis of $16, Valley, except that one of the three lots taken was at $16.10, Valley. This was in face of furnaces making open quotations of $16.25 and $16.50, Valley, on the basis of which we had quoted $16.25 a week ago. Bessemer iron has been quiet, but is firm. Foundry iron has shown an advancing tendency, some small lots for next year having been sold at $16.25. We quote: Bessemer, $17; basic, $16@16.10; No. 2 foundry, $16@16.25; malleable, $15.75@16; forge, $15.50, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—Quotations of $59.50 on contract have been withdrawn, leaving the market on the basis quoted over a week ago by some sellers, $61, Baltimore. Prompt is quoted at about $65, Baltimore, freight to Pittsburgh being $1.95 per ton.

Steel—There are no regular offerings of steel by either mills or brokers. Occasional sales are put through, but are quite rare. The market is not quotable with any accuracy, for usually when steel is scarce there are quotations for farther forward delivery which furnish a quoting basis, but at this time the mills are not quoting for far forward delivery. We note a sale of small openhearth billets at $28, delivered Pittsburgh district, and a sale of standard bessemer billets at $27, delivered, and quote the general market approximately on the following basis, $1 above last week's figures: Bessemer billets, $26; bessemer sheet bars, $26.50; openhearth billets, $27; openhearth sheet bars, $27.50; rods, $29, f.o.b. maker's mill, Pittsburgh or Youngstown. The New York State Steel Co. is about to start its plant at Buffalo, N. Y., with a capacity of about 12,000 tons of billets a month, a portion of which will be sold in the market.

Sheets—As noted, about three weeks ago some of the sheet mills began advancing prices $2 a ton, to 2.25c. for black and 3.40c. for galvanized, and last week several more mills made advances. It is understood that the leading interest has advanced its prices, although no official information is available, and by the end of the week all sellers will probably be on the new basis. Meanwhile we quote: Black sheets, 28 gage, 2.15@2.25c.; galvanized, 28 gage, 3.30@3.50c.; blue annealed, 1.60@1.65c.; painted corrugated, 2.35@2.45c.; galvanized corrugated, 3.35@3.55c. per lb. Business for first quarter has been coming in very freely to the mills willing to sell, but some of them, particularly those uncertain as to whether they will be able to obtain steel, have refrained from selling for that delivery. Mills are running practically at capacity, though occasionally operations are curtailed by shortage of steel or of labor.

St. Louis

Oct. 14—Pig iron is in good demand, though buying is checked by the sharply advanced prices. For Southern No. 2 foundry $14, Birmingham, or $17.75, St. Louis, is the minimum figure. A number of agencies are out of the market for the present, and a few are asking a premium over this figure for first-half delivery, though as yet, it is thought there has been no business done at over $14. Northern iron is quoted at $18@18.25, St. Louis. Owing to the advance in Southern, there have been more inquiries for Northern than usual.

The coke market is also very stiff, foundry coke bringing $6@6.25, St. Louis.

Iron Ore Trade

Lake Superior iron-ore shipments by ports for the season to Oct. 1 are reported as follows, in long tons:

Port	1911	1912	Changes
Escanaba	3,086,847	4,010,985	I. 924,138
Marquette	1,568,711	2,567,578	I. 998,867
Ashland	1,878,786	3,623,161	I. 1,744,375
Superior	7,946,109	11,097,276	I. 3,151,167
Duluth	5,501,364	7,729,187	I. 2,227,823
Two Harbors	4,855,320	7,310,195	I. 2,454,875
Total	24,837,137	36,338,382	I. 11,501,245

Of the shipments in September, a total of 5,536,291 tons, or 76%. were delivered at Lake Erie ports.

Some more sales of El Cuero low-phosphorus ore to Eastern furnaces are reported at 9½c. per unit, f.o.b. cars Philadelphia.

German Foreign Trade—Imports and exports of ores in Germany, eight months ended Aug. 31, metric tons:

	Imports	Exports	Excess
Iron ore	8,043,722	1,506,403	Imp. 6,537,319
Manganese ore	322,070	4,249	Imp. 318,821

Imports of ores are chiefly from Spain, Sweden, France and Russia.

METAL MARKETS

New York, Oct. 16—The copper market has been disturbed by a heavy fall on the London market, due to the war rumors in Europe. Apart from this the metal markets have been generally strong.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Aug. 1912	$ 2,498,472	$ 5,576,900	Imp. $3,078,428
" 1911	480,799	4,105,331	Imp. 3,624,532
Year 1912	43,159,972	34,589,111	Exp. 8,570,861
" 1911	15,910,449	40,473,010	Imp. 24,562,561
Silver			
Aug. 1912	5,574,644	3,952,279	Exp. 1,622,365
" 1911	4,869,359	3,653,329	Exp. 1,216,030
Year 1912	45,834,920	32,652,869	Exp. 13,182,051
" 1911	44,587,570	29,534,724	Exp. 15,052,846

Exports from the port of New York, week ended Oct. 12: Gold, $40,100; silver, $1,124,989, principally to London. Imports: Gold, $4,148,753, from London and Mexico; silver, $68,709, from Central America.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. The demand for gold from Paris and Berlin is active, but most of the supplies were retained in London.

The revised statement of the United States Mint puts the gold production of the United States in 1911 at 4,687,053 oz., or $95,890,000. This is $379,100 less than in the preceding year.

Platinum—The market remains firm, both here and abroad. There is much speculation as to the time when the new law prohibiting the export of crude platinum from Russia will be put into effect. Dealers here continue to ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, up to 10% iridium.

Iridium—Prices are still high, $68@70 per oz. being asked for the metal.

Silver—The market had a reaction during the week owing to some speculative selling. Since then, however, it continues steady with no wide fluctuations in sight. Consequently for the present it seems as if the changes in price would be within narrow limits.

The production of silver in the United States in 1911, according to the revised statement of the director of the Mint, was 60,599,400 oz., an increase of 3,461,500 oz. over the preceding year.

SILVER AND STERLING EXCHANGE

Oct.	10	11	12	14	15	16
New York	63⅜	62¾	....	63¼	63½	63⅜
London	29¼	29	29¼	29 7/16	29 7/16	29⅜
Sterling Ex.	4.8555	4.8545	....	4.8595	4.8595	4.8585

New York quotations, cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine.

Copper, Tin, Lead and Zinc

NEW YORK

Oct.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
10	17½ @17¾	17.30 @17.40	50	5.10	4.90 @4.92½	7.45 @7.50	7.30 @7.35
11	17¼ @17¾	17.30 @17.40	49⅛	5.10	4.90 @4.92½	7.40 @7.50	7.25 @7.35
12	.....	.....	....	....	.....	.....	.....
14	17½ @17¾	17.10 @17.30	49⅛	5.10	4.90 @4.92½	7.40 @7.45	7.25 @7.30
15	17½ @17¾	17.20 @17.30	49⅛	5.10	4.90 @4.92½	7.40 @7.45	7.25 @7.30
16	17½ @17¾	17.30 @17.40	49⅝	5.10	4.90 @4.92½	7.40 @7.45	7.25 @7.30

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market, which had remained quiet up to Oct. 12, received a jolt on Oct. 14 through the severe break in the London standard market, which fell to the parity of about 16½c., New York. While the largest of the American agencies professed utter disregard of this and maintained the pegged price of 17¾c., delivered, etc., as their price

LONDON

Oct.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
10	77¼	78⅛	82¾	228¼	227¼	21⅜	27⅝
11	76⅞	77⅝	82⅛	226	225	21⅜	27⅝
12	....	....	....	.....	.....	....	....
14	74¼	75	79	224	222½	21	27⅝
15	75⅜	76¼	81	225¼	224	21⅛	27⅝
16	76 11/16	77 11/16	82	226	225¼	21	27⅝

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

asked, others took advantage of the opportunity for profitable arbitrage transactions and sold freely for what they could get, a good deal being placed at 17¼@17⅜c., delivered, usual terms. In the aggregate transactions amounted to some millions of pounds, practically all with domestic consumers, sales to Europe being, of course, precluded under the conditions. The improvement in the London market gave a stimulus to the domestic, which closes a good deal steadier, but electrolytic is still offered at about 17½c., delivered. The business in Lake copper during the week has been relatively insignificant, and quotations are consequently more or less nominal. At the close Lake copper is quoted at 17½@17¾c., and electrolytic in cakes, ingots and wirebars at 17.30@17.40c. Casting copper is quoted nominally at 17.15@17.25c., as the average for the week.

The unsettlement on the large European exchanges, brought about by the Balkan disturbance, acted simultaneously on the London standard market, which was seriously affected and on Oct. 14 suffered a break, which at one time put the quotation down to £72 5s. for spot and £73 for three months. The recovery, however, was equally rapid, and the market closes firm at £76 13s. 9d. for spot and £77 13s. 9d. for three months.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼ base, carload lots at mill.

Tin—The Balkan scare, which created panicky conditions on the large European exchanges, was not without its effect on this metal, too. The unsettlement commenced on Oct. 11 of last week, when tin declined about £2 on comparatively small sales. A further sharp break occurred on Oct. 14, when spot tin touched £221 5s. and three months £220. However, a good deal of this decline was recovered, and though not at its high point, the market closes steady at £226 for spot and £225 5s. for three months.

Naturally, prices here followed the trend of the London market, but no extraordinary pressure to sell developed. The lower level was taken advantage of by consumers to cover a large part of their requirements. October tin is quoted at about 49⅝ cents.

Lead—St. Louis sellers have come out somewhat more freely and are booking business at slight concessions. Lead is quoted there 4.90@4.92½c. There is no change in this market, where lead is selling at 5.10, but lead for shipment to Eastern points is offered at less than the New York basis.

The London market is easier, Spanish lead being quoted at the close at £21 and English lead £21, 2s. 6d. per ton.

Our attention has been called to the quotation for Spanish lead at London on Jan 17, 1912, in the JOURNAL of Jan. 20, 1912, where it is given as £15 13/16, which price was used in the computation of the monthly average. Upon investigation we find this to have been erroneous, the correct price on Jan. 17, 1912, being £15 7/16. At this late date we are unable to explain the error, which may have been either clerical or typographical, but probably the former. The average price of Spanish lead at London for January, 1912, was £15.597, instead of £15.619 as heretofore reported.

Spelter—This market has been quiet. The demand from consumers seems to be well covered and there is no urgency on their part to purchase. Offers from sellers are coming forward somewhat more freely and at slightly lower prices. St. Louis is quoted 7.25@7.30c.; New York, 7.40@7.45 cents.

No change is reported from London, which is quoted £27, 12s. 6d. for good ordinaries and £27 17s. 6d. for specials.

Base price of zinc sheets is $9 per 100 lb., f.o.b., La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted 7¾c. per lb., New York.

Other Metals

Aluminum—Business remains good, both here and abroad, and prices are a little firmer. We quote 25½@26½c. per lb. for No. 1 ingots, in large lots, New York.

Antimony—Business has been fair but prices are a little easier. Cookson's is quoted at 10@10⅛c. per lb.; Hallett's at 9¼@9½c.; Chinese, Hungarian and other outside brands at 8¾@9c. Supplies are moderate only, and an advance is expected soon.

Quicksilver—The market has been rather more active, but prices here are unchanged. New York quotations are $42 per flask of 75 lb., with 60c. per lb, for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. The London price is £8 per flask, with £7 17s. 6d. quoted from second hands.

Cadmium—Paul Speier reports from Breslau, Germany, that the current price of cadmium is 725@750 marks per 100 kg., f.o.b. works—equal to 78.27@80.97c. per lb. The production in Silesia for the half-year ended June 30, 1912, was 21,833 kg., an increase of 988 kg. over last year.

Nickel—Shot, blocks, plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 12—The high price of zinc sulphide ore was $63, the base per ton of 60% zinc $55@60. Zinc silicate sold at $32@34 per ton of 40% zinc. The average price for all grades of zinc is $57.22 per ton. Lead sold as high as $68, the base being $63@65 per ton of 80% metal assay. The average price of all grades of lead is $63.54 per ton.

The weakening market for zinc ore is causing some producers to withhold their product from the market, and each week

SHIPMENTS WEEK ENDED OCT. 12

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,648,700	.....	1,124,320	$170,790
Joplin	3,184,560	.....	264,360	103,997
Duenweg	918,250	.....	119,460	30,451
Galena	711,330	.....	78,000	23,124
Oronogo	485,720	.....	235,300	19,784
Alba-Neck	499,630	.....	42,180	16,295
Cave Springs	481,770	.....	11,130	15,290
Spurgeon	115,720	312,860	90,290	11,669
Carl Junction	195,600	.....	10,150	6,486
Granby	189,240	121,600	14,660	5,800
Springfield	84,000	.....	60,000	4,750
Jackson	129,680	.....	.....	3,760
Carthage	138,000	.....	.....	3,726
Miami	129,720	.....	.....	3,500
Sarcoxie	63,410	57,510	.....	2,747
Wentworth	64,320	.....	.....	1,736
Quapaw	62,190	.....	.....	1,680
Totals	12,101,840	491,970	2,049,850	$425,585
41 weeks	438,663,140	27,754,490	73,726,280	$14,213,330

Blende val., the week, $351,840; 41 weeks, $11,689,277
Calamine, the week, 8,615; 41 weeks, 436,043
Lead value, the week, 65,130; 41 weeks, 2,088,010

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	59.75	41.29	57.07	59.33	61.26
October	42.38	.....	40.89	.....	54.72	.....
November	45.40	.....	43.25	.....	57.19	.....
December	44.13	.....	40.76	.....	62.03	.....
Year	$41.45	.....	$39.90	.....	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

there is an increasing tonnage of unsold ore in the bins. Six weeks ago all stock on hand was sold at each week-end; now the bulk of stock, very little larger than then, is being held for an upward turn of the market.

Platteville, Wis., Oct. 12—The base price paid this week for 60% zinc ore was $56@60. The base price paid for 80% lead ore was $64@65 per ton.

SHIPMENTS WEEK ENDED OCT. 12

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	702,300	.....	.....
Platteville	466,980	.....	238,000
Hazel Green	420,000	.....	.....
Shullsburg	400,000	.....	.....
Galena	291,400	.....	.....
Benton	384,000	80,000	567,000
Cuba City	185,060	.....	313,840
Harker	129,970	.....	.....
Highland	126,600	109,500	.....
Montfort	84,000	.....	.....
Total	3,290,310	189,500	1,118,840
Year to date	158,527,860	6,541,160	28,329,490

Shipped during week to separating plants, 1,970,965 lb. zinc ore.

Chemicals

New York, Oct. 16—The general markets are active and business is in good condition.

Arsenic—Spot supplies are still scarce. Glassmakers are inquiring for considerable quantities, and makers of insecticides are beginning to prepare for the spring trade in Texas. Quotations are $4.87½@5.12½ per 100 lb. for spot and early deliveries; while futures have advanced, $4.75@5 per 100 lb. being firmly held.

Cobalt Oxide—There has been a sharp advance of 10c., and the quotation is now 90c. per lb., New York.

Copper Sulphate—Demand is good and the market is steady. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is good, and prices for spot and November have advanced a shade, to 2.57½c. per lb. Later deliveries are unchanged, 2.57½c. per lb. being asked for them also.

Petroleum

Berlin dispatches state that a government bill, aimed at the Standard Oil Co., is announced Oct. 14 in the semi-official *Norädeutsche Allegemeine Zeitung*. The provisions of the bill are intended to bar that company from the wholesale business in illuminating oils in Germany, which is to be intrusted to a national stock company, operating under government supervision. The new company is to be empowered to acquire the existing wholesale oil plants and stocks by expropriation, if necessary. The capital of the new company is to be furnished partly by the German banks and partly by open subscription. The banks are to be given registered shares and an increased voting power, in order to prevent any attempt to obtain foreign control. The life of the corporation is fixed at 30 years. The company is to be strictly under government control as to prices and business connections.

The success of the measure, says the semi-official newspaper, is dependent on adequate supplies of independent oil. Negotiations with independent producers of America, Russia, Roumania and Galicia indicate that contracts for the greater part of the German supply can be arranged outside the Standard.

Mining Stocks

New York, Oct. 16—On Oct. 10, the Exchange was moderately active, with few changes. Mining stocks on the Curb were active, but irregular. Coppers were off a fraction, but others stocks were inclined to be firm.

Oct. 11 the Exchange was uncertain, chiefly owing to depression abroad. On the Curb coppers were rather quiet and irregular. Other mining stocks were in fair demand and firm.

Oct. 12 was a holiday. Oct. 14 the markets were slow and hesitating. Sales of mining stocks on the Curb were not especially active and the tendency was to small declines in prices.

Oct. 15 and 16 the Exchange was more active, with a rather stronger tone, and some advances. The Curb was more active and quotations were firmer. Mining stocks were not in special demand, but were fairly firm, with the exception of the coppers, which were a little weak.

Boston, Oct. 15—The most prominent development and feature among the copper issues is the entrance of United States Smelting interests into the directorates of two of the former Dow properties—Indiana and Franklin. These issues responded to this favorable solution of difficulties by advancing for the week $2¼ and $1⅞, respectively, to $16¾ and $10⅜. The trend during the week, as a whole, has been upward, though the sharp break in London copper warrants caused some uneasiness which resulted in a mild set-back. On account of this, prices show little net change for the week.

Optimistic reports regarding underground developments at the North Butte property persist, but drifting on the new orebody has been discontinued. Earnings are reported large and copper costs declining.

The East Butte management has come to no decision with respect to new financing and it may be that no permanent securities will be issued. Foreign selling is held responsible for the continued weakness of Ray and Chino, as conditions at the mines are said to be never more promising.

Trading on the Curb has been rather brisk and broad. Old Dominion trust

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	July	August	Sept.
Alaska shipments	2,224,441	1,242,836	1,726,715
Anaconda	23,000,000	25,250,000	24,500,000
Arizona, Ltd	3,200,000	3,260,000	3,340,000
Copper Queen	7,708,147	8,040,424	9,103,861
Calumet & Ariz	4,748,000	4,514,000	4,462,000
Chino	2,945,000	3,437,309	3,372,369
Detroit	2,194,090	1,882,289	1,881,668
East Butte	1,261,304	1,410,500	1,250,000
Mammoth	1,818,738	1,802,590	.....
Mason Valley	1,500,000	.....	.....
Nevada Con	6,084,274	.....	.....
Ohio	617,500	.....	.....
Old Dominion	2,543,763	2,597,896	2,204,000
Ray	2,985,965	2,888,095	.....
Shannon	1,446,000	1,400,000	1,142,000
South Utah	142,555	224,855	225,568
United Verde*	2,500,000	2,500,000	2,750,000
Utah Copper Co	10,602,000	11,248,992	.....
Lake Superior*	19,500,000	21,000,000	.....
Non-rep. mines*	8,970,000	8,970,000	.....
Total production	105,991,687	.....	.....
Imports, bars, etc.	25,586,735	.....	.....
Total blister	131,578,422	.....	.....
Imp. in ore & matte	7,748,392	.....	.....
Total American	139,326,814	.....	.....
Miami†	3,027,710	3,048,750	2,949,150
Brit. Col. Cos.:			
British Col. Copper	1,026,000	941,364	.....
Granby	1,802,753	1,970,388	.....
Mexican Cos.:			
Boleo†	2,386,480	.....	.....
Cananea	4,000,000	4,044,000	3,500,000
Moctezuma	3,094,016	3,229,839	771,844
Other Foreign:			
Cape Cop., S. Africa	.....	.....	.....
Kyshtim, Russia	1,325,000	.....	.....
Spassky, Russia	795,200	902,720	.....
Famatina, Argen.	.....	.....	.....
Tilt Cove, Newf'd	.....	.....	.....
Exports from:			
Chile	8,960,000	8,512,000	6,048,000
Australia	8,288,000	8,064,000	7,616,000
Arrivals in Europe‡	14,114,240	20,200,320	8,518,720

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
IX, 1911	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331
VIII	145,628,521	78,722,418	70,485,150
IX	140,089,819	63,460,810	60,264,796

VISIBLE STOCKS

	United States	Europe	Total
X, 1911	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX	46,701,374	113,568,000	160,269,374
X	63,065,587	107,408,000	170,473,587

receipts were in the fore, selling down to $6½, off two points. Although Davis-Daly was reported to have encountered an orebody 12 ft. wide and improving, averaging over 3% copper, this stock did not respond to the news with anything more than a fractional gain.

Assessments

Company	Delinq	Sale	Amt
Best & Belcher	Nov. 6	Nov. 25	$0.05
Black Bear, Ida	Sept. 26	Oct. 26	0.01
Black Horse, Ida	Oct. 18	Nov. 8	0.01
Bullion, Nev	Oct. 16	Nov. 6	0.03
Columbus Extension, Utah	Sept. 30	Oct. 23	0.02½
Eagle Mt., Ida	Sept. 23	Oct. 23	0.00½
Eastern Star, Ida	Oct. 12	Nov. 12	0.002
Empire, Ida	Sept. 23	Oct. 23	0.002
Exchequer, Nev	Oct. 30	Nov. 20	0.03
Franklin, Mich	Oct. 18		2.00
Great Eastern, Ida	Sept. 28	Oct. 28	0.002½
Hale & Norcross, Nev	Oct. 3	Oct. 24	0.05
Holy Terror, Ida	Oct. 18	Nov. 18	0.00¾
Hypotheek, Ida	Oct. 14	Nov. 4	0.01
Indiana, Mich	Oct. 16		1.00
Michigan Cop. & Gold, Utah	Oct. 2	Oct. 22	0.00½
Oneco, Mich	Oct. 10		1.00
Ophir, Nev	Nov. 11	Dec. 9	0.15
Rhoade Island, Ida	Oct. 31	Nov. 30	0.00½
Savage, Nev	Oct. 2	Oct. 24	0.10
Seg. Belcher, Nev	Oct. 4	Oct. 25	0.02
Snowshoe, Ida	Sept. 30	Oct. 30	0.005
Temple, Ida	Sept. 30	Oct. 30	0.002
Union Con., Nev	Oct. 15	Nov. 6	0.15
Utah Ideal, Utah	Oct. 9	Nov. 10	0.01
Yellow Jacket, Nev	Oct. 30	Dec. 3	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63.078	24.567	24.209	29.088
October	55.490	53.340		25.596	24.594	
November	55.635	55.719		25.680	25.649	
December	54.428	54.905		25.160	25.349	
Year	53.486	53.304		24.670	24.592	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.189		12.370		55.170	
November	12.616		12.769		57.253	
December	13.552		13.768		62.068	
Year	12.376		12.634		55.973	

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.614	42.962	August	43.319	45.857
March	40.157	42.577	September	39.755	49.135
April	42.185	43.923	October	41.185	
May	43.115	46.053	November	43.125	
June	44.606	45.815	December	44.655	
			Av. Year	42.281	

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.597
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	4.569	4.406	4.452	14.260	19.679
September	4.485	5.048	4.356	4.924	14.744	22.292
October	4.265		4.139		15.332	
November	4.298		4.181		15.821	
December	4.450		4.332		15.648	
Year	4.420		4.286		13.970	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5.869	7.454	5.719	7.313	27.750	27.048
October	6.102		5.951		27.256	
November	6.380		6.223		26.795	
December	6.301		6.151		26.849	
Year	5.758		5.608		25.281	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90	16.86	13.57	16.03	14.40	15.63
October	15.43		13.44		14.34	
November	14.92		13.30		14.25	
December	15.15		13.10		13.90	
Year	$15.72		$13.94		$14.49	

STOCK QUOTATIONS

COLO. SPRINGS Oct. 15

Name of Comp.	Bid.
Acacia	‡.04
Cripple Cr'k Con.	.01
C. K. & N.	.17½
Doctor Jack Pot.	.05½
Elkton Con.	.64½
El Paso	5.49
Findlay	.04½
Gold Dollar	.18½
Gold Sovereign	.02½
Isabella	.18
Jack Pot	.05
Jennie Sample	.07
Lexington	‡.007
Moon Anchor	‡.007
Old Gold	.03½
Mary McKinney	.72½
Pharmacist	.01½
Portland	.99
Vindicator	.82
Work	.01

SALT LAKE Oct. 15

Name of Comp.	Bid.
Beck Tunnel	.08
Black Jack	.07½
Cedar Talisman	.00½
Colorado Mining	.15
Columbus Con.	.11
Crown Point	.01½
Daly-Judge	5.75
Grand Central	.62
Iron Blossom	1.20
Little Bell	‡.20
Lower Mammoth	.06
Mason Valley	12.00
May Day	.16
Nevada Hills	1.67½
New York	.01
Prince Con	1.75
Silver King Coal'n	2.90
Sioux Con.	‡.04½
Uncle Sam	.11
Yankee	.14½

TORONTO Oct. 15

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	‡7.45	Foley O'Brien	.16
Hudson Bay	‡63.00	Hollinger	14.15
Temiskaming	.36	Imperial	.02½
Wettlaufer-Lor	.35	Pearl Lake	.25½
Am. Goldfield	‡.50	Porcu. Gold	.21½
Apex	.02½	Preston E. D.	.03
Crown Chartered	.04½	Rea	.25
Dobie	‡.20	Standard	.00¾
Dome	22.00	Swastika	.09½
Dome Exten	.12½	West Dome	‡.15

SAN FRANCISCO Oct. 15

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.04
Belcher	.27
Best & Belcher	.04
Caledonia	1.45
Challenge Con	.05
Chollar	.07
Confidence	.42
Con. Virginia	.39
Crown Point	.31
Gould & Curry	.01
Hale & Norcross	.12
Mexican	2.70
Occidental	.70
Ophir	.46
Overman	.70
Potosi	.03
Savage	.11
Sierra Nevada	.28
Union Con	.56
Yellow Jacket	.26

N. Y. EXCH. Oct. 15

Name of Comp.	Clg.
Amalgamated	89¾
Am. Agri. Chem.	58⅜
Am.Sm.&Ref.,com	85½
Am. Sm. & Ref., pf.	107⅜
Am. Sm. Sec., pf. B	86
Anaconda	44¼
Batopilas Min	1⅝
BethlehemSteelpf	77
Chino	42⅜
Federal M. & S., pf.	46½
Goldfield Con	2⅜
GreatNor.,ore,ctf.	48⅜
Guggen. Exp	58¾
Homestake	99
Inspiration Con.	20½
Miami Copper	27⅛
Nat'nalLead,com.	65½
National Lead, pf.	108½
Nev. Consol	22⅜
Phelps Dodge	215½
Pittsburg Coal, pf.	95½
Ray Con	21½
Republic I&S,com.	33⅜
Republic I & S, pf.	91
SlossSheffi'd,com.	55
Sloss Sheffield, pf.	95
Tennessee Copper	43⅝
Utah Copper	63¼
U. S. Steel, com	77½
U. S. Steel, pf.	114⅜
Va. Car. Chem.	48¼

N. Y. CURB Oct. 15

Name of Comp.	Clg.
Barnes King	‡.78
Beaver Con	.41
Braden Copper	6⅞
B. C. Copper	5
Buffalo Mines	1⅞
Caledonia	.40
Con. Ariz. Sm.	⅝
Davis-Daly	2⅛
Diam'field-Daisy	7
Ely Con	.21
Florence	.80
Giroux	4⅛
Gold Hill Con	1/16
Greene Cananea	10¼
Greenwater	.04
Internat. S. & R.	‡124
Kerr Lake	2¼
Keystone	1⅞
La Rose	2½
McKinley-Dar-Sa.	1⅞
Min. Co. of A. new	3
Motherlode Gold.	‡⅛
Nev. Utah M. & S.	‡.01
Nipissing Mines	8¼
Ohio Copper	1⅛
Pacific Sm. & M.	3/32
South Live Oak	2
South Utah M. & S.	5/16
Standard Oil (Old)	1110
Stand'd Oil of N.J.	399
Stewart	1⅛
Tonopah	6¼
Tonopah Ex	2⅝
Tonopah Merger	1⅛
Tri-Bullion	1/16
Tularosa	1/16
Union Mines	.10
United Cop., pfd.	10
Yukon Gold	3 7/16

LONDON Oct. 16

Name of Com.	Clg.
Camp Bird	£1 6s 6d
Dolores	1 10 0
El Oro	0 14 9
Esperanza	2 3 1½
Mexico Mines	6 17 6
Oroville	0 5 3
Stratton'sInd.	0 3 1½
Tomboy	1 7 0

BOSTON EXCH. Oct. 15

Name of Comp.	Clg.
Adventure	7
Ahmeek	340
Algomah	4¼
Allouez	45½
Am. Zinc	33½
Ariz. Com., ctfs.	4¼
Bonanza	.35
Boston & Corbin	6¾
Butte & Balak	3¾
Calumet & Ariz	81
Calumet & Hecla	588
Centennial	20
Cliff	‡4⅛
Copper Range	58
Daly West	3¾
East Butte	16¼
Franklin	10
Granby	63
Hancock	26¾
Hedley Gold	‡20
Helvetia	.85
Indiana	16¼
Island Cr'k, com.	‡56
Island Cr'k, pfd.	88½
Isle Royale	35½
Keweenaw	2
Lake	34⅞
La Salle	‡5¾
Mass	‡7
Michigan	1¾
Mohawk	66
New Arcadian	3
New Idria Quick.	5¾
North Butte	38¾
North Lake	4¼
Ojibway	3¾
Old Dominion	61½
Osceola	113
Quincy	86½
Shannon	15¾
Shattuck-Ariz.	28
Superior	44¼
Superior & Bost.	1⅛
Tamarack	46
Trinity	5¼
Tuolumne	2⅞
U. S. Smelting	48¾
U. S. Smelt'g, pf.	51¾
Utah Apex	2
Utah Con	13
Victoria	3
Winona	5
Wolverine	77
Wyandot	1⅛

BOSTON CURB Oct. 15

Name of Comp.	Last
Alaska Gold M.	9⅛
Bingham Mines	5½
Boston Ely	1
Boswyocolo	.01½
Butte Central	7
Cactus	.10
Calaveras	2⅜
Chief Cons	1⅜
Corbin	1
Cortez	.81
Crown Reserve	3½
First Nat. Cop.	1½
Majestic	.46
Mazatan	‡½
Moneta Porc.	‡.03
Nevada-Douglas	3⅛
New Baltic	2
Oneco	2½
Raven Copper	.30
Rhode Island Coal	‡.10
San Antonio	‡3
Smokey Dev.	2 7/16
S. W. Miami	6½
South Lake	7
Trethewey	.30
United Verde Ext.	.44

‡Last quotation.